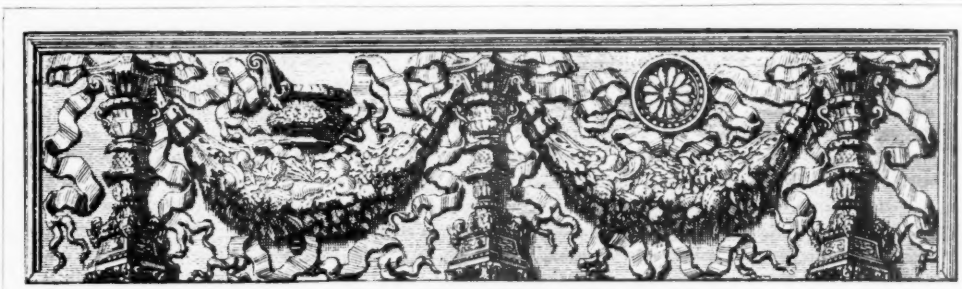


RUSKIN AND EMOTIONAL ARCHITECTURE.

By Professor Kerr [*F.*].

IT is one of the most brilliant and successful writers of the Victorian age who has now passed away in the person of the late Mr. Ruskin, and Literature and Art do well to clothe his memory with special honour. During the fifty years of his busy career, the versatility he displayed caused no little astonishment; but every topic he dealt with was so handled, with the same fascinating ease and persuasive vigour, that the volume of his doctrine seems like a single picture painted in a thousand harmonious colours. Strange to say, amongst the subjects he ventured to take in hand, one of the most conspicuous was the esoteric Art of Architecture, concerning which, in any form of practice, he knew (in plain language) nothing at all; but no one could help acknowledging that the views he brought forward were always original, courageous, and persuasive, adorned with every graciousness of speech, and every word designed to magnify an elevated purpose and make it honourable. It may well, therefore, be considered a professional duty with us as architects, no less than a valuable intellectual exercise, to ask ourselves the question, with some anxiety, what has been the nature of his influence upon the practice and progress of architecture, and what its extent; not an easy question to attempt to answer, and one full of matter for debate.

It need scarcely be said that Ruskin was "of imagination all compact"; fanciful from the earliest days—perhaps whimsical; and iridescent to the last, till, a few sad years ago, the too bright light went out. He was emphatically an oddly constituted man, one of those eccentrics who more commonly fall into the ruck in the race of life and make no running, but who occasionally, as in this case, dash to the front and keep the lead. He must not therefore be taken too seriously, or criticised at all carelessly. Sentimental emotion was the root and branch of his being; in dreamy quietude and gentleness when it might be so, in volcanic impulsiveness when otherwise; the restless soul never quite sober, often intoxicated with inspiration not to be expressed. When so severely substantial a theme as the solid walling of the builder was undertaken, one might think he had come upon an exception to his rule; it was nothing of the kind; our wonder was only increased when we saw it treated by the writer on pictures as an example of exceptional force. Those who remember the time will remember the astonishment created by his doctrines in the world of fifty years ago. To say that he was not understood then is not enough; is he understood now? At any rate, he was like no one else. Let us therefore look at such a man from his beginnings, and with the fulness of attention due to a genius so strange.

He was the solitary and very quaint child of a remarkable father. Ruskin senior, a Scotch puritan born, a self-made London merchant, a steady-going prosperous City man,

living in the mild beatitude of Bloomsbury, was by way of recreation fond of reading poetry, being able also to read it poetically; equally fond of sketching a bit of landscape, and able to sketch it fairly well; lastly—and here we come closer to the point—enthusiastically fond of Turner's drawings, indeed a collector of them. Ruskin junior, let us say plainly—for it is a good deal to be able to say so soon—was "a chip of the old block," of whom it is by himself put on record that he came in due course to be—no rare phenomenon or contemptible—an extremely self-conceited youth, of transcendental proclivities, engaged betimes in "forming his style" on Sir Walter Scott, Homer, and the Bible, and capable of setting himself seriously to work, at seventeen, on the adventurous task of writing a tragedy. Is not all this exactly as it should be? But again, the father, in the way of business, had to journey about a good deal, throughout England and Scotland—in an old-fashioned way in a chaise—as his own "traveller"; and he would take his queer and inquisitive boy with him at times, to enjoy the natural scenery of the open country and look at things after the manner of Turner, who "hated humbug of all sorts." They even had a little continental travel together, and saw the ancient picturesque cities of Europe, the great mountain ranges of perpetual snow, the famous rivers and valleys, the radiant palaces and solemn cathedrals; all viewed sentimentally, and, of course, more so by the quaintly curious and astonished son than by the exulting and animating father. So in due time it was resolved by the admiring parents that, as they could well afford it, he should "go to Oxford," and in the best company that money could buy, so that he might rise in the world and probably become such a thing as a bishop. We can scarcely fancy Ruskin a bishop, or think of his reception by the orthodox clergy; but to Christ Church he went; dear mother, now getting elderly, taking lodgings in the town to look mildly after him, and father coming down by coach at the week-ends to keep them company joyfully. Surely this is a most pleasant picture, and profitable for all of us to look at, and the contemplation of it the right way to begin if we would judge humanly, and therefore naturally, of even a meteoric life. And there is one finishing touch of nature to be added; the parents, in their humdrum good sense, thought it good to be careful not to promenade too noticeably in the company of their prodigy, lest they should do him a little discredit in the eyes of his patrician fellows. Of these it is interesting to know that the still active Lord Wemyss was one, much esteemed as Frank Charteris.

In *London's Magazine* of date 1837* there may be found one or two correspondence-articles signed "Kataphusin" and modestly entitled "Introduction to the Poetry of Architecture." The writer, aged eighteen, was Master John Ruskin, and "Kataphusin" was meant by him to be interpreted by the vernacular words "According to Nature." Observe the significance of this. The grand old Fine-art of Architecture, viewed from a poetic standpoint, was to be brought into notice on the basis of "Nature." It was by a precocious young man, but why not? "Behold how great a fire a little spark kindleth!" Although nothing seems to have come of the adventure—except, as it is thought, abrupt editorial closure—is not this already the very question that was afterwards to be pressed upon us with such fervid eloquence—that Nature, Poetry, Art—not excluding even serious Architecture—are sympathetically, emotionally, one and the same? The work of this young man's life was to be the answering of this question.

He was already a sufficiently muscular Christian in mind, but had a full share of ill health of body during his University career; and the consequence was a lengthened time of travel in France and Italy, where, particularly at Geneva and Venice, he devoted himself almost exclusively to the pursuit of his dreams of Nature and Art. At length he was able

* Not in our Library; it might be worth while to look it up.

to take his degree at Oxford, in 1842. He rushed at one bound into literature. He had won the great academical prize for "English poetry" in 1839, but he resisted the temptation to rush into that; perhaps it was too troublesome a pursuit for his patience; in riper days he declared that he was not a poet. But let all this pass; assuredly he was not the opposite; not a word of his prose was prosaic. At any rate, he had discovered with the best of poets, that our poor world is very much out of joint, and needs mending with eloquent speech; and so he proceeded forthwith to be, what another distinguished admonisher of mankind, Carlyle, has proudly dubbed himself, a "Writer of Books." In fact the publication of the first volume of *Modern Painters* took place—and took the world by storm—in the year after the taking of his degree; actually in the twenty-fourth year of his age!

In the present notice we must let alone the subject of pictorial art; but the fact cannot be overlooked that the grand purpose which had been burning in the breast of this extraordinary youth, and now found utterance, was the recognition in "Art," undefined, of the divine element "Nature," equally undefined. In aftertime the bold Adventurer could afford to speak of this first book of his as a mistake; but at the least it made a sufficient impression upon artists and art-critics, and, together with the succeeding volumes of the work, still retains its place on the bookshelves as a classic.

We may now come at once to the *Seven Lamps of Architecture*, published in 1849, when the author was still only thirty years of age. It was twelve years since our philosopher as a schoolboy had offered to expound to the world "the poetry of architecture," not getting leave from the editor; but now he was the "Oxford Graduate" of *Modern Painters*, a celebrity, able to command attention. Architecture had evidently taken a strong hold upon his imagination. We are told that in his continental travels the symbolical and solemnizing ceremonial of the ecclesiastical worship had greatly impressed him; and that, although still patriotically "protestant," he had come to discard the "evangelicism" of his pious mother's early training. We have to bear in mind, moreover, that at the University he had been in the midst of the "Oxford movement." But perhaps he had also had the advantage of passing a few years in an architect's office? Not at all. Or of drawing from the "examples" at the School of Design? Nothing of the kind. What then? He had simply been dreaming of Art and Nature undefined. Do not suppose that this use of the word "undefined" must cover implied rebuke or feeble sarcasm; observe that, by an emotional intelligence such as this, impracticable definition must be avoided. But now the impulse had taken possession of him to attempt to reduce the undefined to something like scholastic system, and no doubt it was well to accept architectural art for the experiment. His ideas of Art from first to last were always pictorial, and in his selection of structural design for this exposition it was in a sort of pictorial aspect that it attracted him. The "seven lamps" of architecture, therefore, were to be so many principles of Nature undefined which, as he had shown in relation to painting, should govern Art undefined in building; operating, of course, altogether above and beyond the careless and the commonplace, and only thus achieving Architecture. The neglect of those principles must of necessity make the work of men's hands "vile," "loathsome," "a pain to see," and so on; and, as such, a species of affront to the spirit of "the Creator's work;" whereas the devout recognition of them made the same work a delight—emotional obviously, not visual—and (so to say) an offering of homage to the God of Nature. This book, like its predecessor, was pronounced by the author in aftertime to be "the most useless book I ever wrote;" but we know better; repudiation of that kind was a way he had, a manner of piquant humour, a paradoxical pleasantness of affectation; and what we now have to do is to understand, if we can, what those seven principles may be which are here in question under the poetic name of Lamps of Art lighting up the otherwise dull and dead work of the

builder. The author designates them thus:—the lamps of (1) Sacrifice, (2) Truth, (3) Power, (4) Beauty, (5) Life, (6) Memory, and (7) Obedience. At first sight this seems to indicate only something fantastically or even whimsically transcendental, scarcely worthy of serious examination; but, although no one could call it anything like a workable scheme of building-design, it is undoubtedly found to contain a certain system of criticism which is exceedingly suggestive to imaginative minds. In more intelligible language, what it was meant to convey was that an edifice worthy of being considered an example of "Art," because following the principles of "Nature," ought to display these characteristics:—(1) a devotional feeling of having offered one's best as if sacrificially (for effect, this ought to come last perhaps, not first), (2) thorough genuineness of device, (3) earnestness of purpose, (4) grace of ornamentation, (5) individual vitality, (6) reminiscence of past examples, and (7) loyalty to past authority; and, as the propounder of this system was in no way a working designer himself, but only an emotional enjoyer of design achieved by others, this critical enjoyment naturally came to resolve itself practically into little more than a romantic preference for mediævalism at large, such as at that time was being made almost a political question in English society.

He had now become—in a certain sense unconsciously—simply an adherent of one of the two architectural parties in "the Battle of the Styles," then raging between two "camps" standing in defiant array against each other, with what Sir Gilbert Scott so sorrowfully called "mutual scorn," and with the neutral ground of Eclecticism between. His personal sympathies being wholly romantic, and the Gothic party being avowedly the romantic party, the Classic party was therefore the prosaic. He was not, however, in any sense a leader in the Gothic movement. Nor indeed was he a follower. He was emphatically a free lance; and not only was his Gothicism quite different from that of the Gothicists, but it went farther than theirs. His admonition was directed impartially against both orders of architects, as being both unworthy of the title; the only difference being that, if the one order might possibly be brought to accept the benefit of his teachings, the inability of the other was hopeless; the Renaissance, he said, being always "abominable." To account for this attitude it must again be borne in mind that at Oxford, being a born sentimentalist, he had been in the midst of the influences of the great sentimental "Movement" of the day; consequently had become a ritualist in personal feeling; consequently again was a Pre-Raffaelite with relation to painting; and thus, again consequently, a Gothicist with relation to architecture. Still more, he had sauntered and languished as an invalid for many months in continental cathedrals, till he had acquired an overwhelming sense of their symbolical solemnity. We know also of his infatuation for Nature undefined, and his training in Turner. Lastly, there comes his consciousness of the triumph of his highly sentimental *Modern Painters*. In all these circumstances, therefore, when restless enthusiasm demanded further exercise, it is easily to be understood how Architecture would be the subject accepted, in order that Art undefined and Nature undefined might on such ground possibly explain each other. The fantastic illumination, also, of the inquiry must be by lamps of dreamlike light such as the seven to which he eventually gave a name; and the quaint antiquities of the mediæval cloister would become far fitter examples of the intangible merits of his vision than the work of the studios of modern Paris and London. As for the writing of the book, the style of treatment and the style of language came of themselves. Instead of the prosy statistical statements of archæologians like Mr. Parker and Professor Willis, and the frantic denunciations of a Pugin, our architectural community had now the pleasure of seeing the loftiest aspiration expressed by a Ruskin in most exquisite phrase and with oracular authority; and whether the seven lamps threw any sort of light upon architecture, or none at all, was a

question of opinion scarcely worth asking. A second treatise, however, and on different lines, equally unexpected, soon after appeared.

This was the celebrated *Stones of Venice*, which came out only about two years after the *Seven Lamps*. The author, albeit still young, having satisfied himself that he was accepted as a monitor on the most delicate questions of artistic sentiment, found that he had more to say on the subject, and indeed on more sensational ground. He had now resolved to carry his building metaphysics into the inviting region of historical romance, within the circuit of the most romantic city in the world, the strange City of the Sea in which modern civilisation had arisen out of the dark, to gain a meteoric culmination, and to suffer a sad decline—dawn, day, and sunset, all its own. He had spent much time in Venice studiously, and had discovered in his imaginative way that there lay hid in its churches and palaces the complete and instructive story of a world by itself, with much of good in it, and more of evil; in other words, that the history of Venice, from the ninth or tenth century to the fifteenth, would form a striking picture of human nature in all its virtue and vice, with visible illustrations in the actual form of extant buildings, well worthy of every one's contemplation for, literally, the soul's good. But he set forth his intention in finer words than these; if he should succeed, he said, as he hoped to do, he would "make of the stones of Venice touchstones, detecting by the mouldering of her marble poison more subtle than ever was betrayed by her crystal." The poison, in a word, was the design of bad architecture, as the "God-forgetting" operation of detestable social wickedness, and an indignity to the supreme essence of Nature. In the *Stones of Venice*, therefore, we have a book, not written for the edification of architects; or even amateurs or critics; but for the amusement of readers of history, and other intellectual mankind and womankind, accessible to romance, and taking a pleasure in reading at their delightful ease charming admonition conveyed in charming English. As architects of the businesslike order would put the case, the history of the Gothic method of Art was somehow best to be followed from its rise to its fall in the historical buildings of Venice, including at the close the modern Neo-Classic; and the author's particular view of the matter was this:—that, when the chaos of the dismal Dark Ages was at length disturbed, the light of Architecture touched Venice first in all the world, like daybreak from the sea; and brightened under God's patronage through the Ages of Faith; but at last, in the deplorable fifteenth century, when men "forgot to see God's hand in everything" (and actually resuscitated the "Arts and Letters" of paganism), plunged by swift sunset into the utter despair of night, in the unhappy misadventure called "the Renaissance," never to be regarded by pious critics but with abhorrence. That such a narrative as this was made highly dramatic need not be said; and of course the substance—for solid substance there was in it after all—was frequently or generally lost in the shadow; but it is enough for us to remember that the story made, and still makes, delightful reading.

In further years Ruskin's philosophy took quite another direction, or several others, with which we are not here concerned; and the question may now be faced—What influence have his writings had, in relation to our own subject of Architecture, upon the practice and progress of the art? Of course he made no pretence of understanding the technical work of architectural design, and it was not with this, directly or indirectly, that he was ever dealing. The essentially fundamental basis of common construction, also, was even more completely unknown to him. His scheme of the "lamps" of illumination shows clearly that it was the romance of superficial or pictorial expression alone that he could recognise. Hence it was that the first of them in order is visible, and entirely as "a mist of fine words," through the religious sense alone. It is a fine sentiment, no doubt, that the thought of "sacrifice," like a morning prayer, should seem to sanctify one's "best"; but this is nothing architectural.

Yes, he would say, yes; because it is Natural, and because the two qualities must be in essence ever the same, or your architecture is not Art, and becomes an abortion, a mere heap of "brick and mortar" which I consign to the dogs; for is not Nature the handiwork of God, and have we absolutely anything else to go by? No; Art is the child of Nature, which is the child of God. This is not his very language, but it is his very doctrine over and over again similarly expressed; the building of the impressive sublime, or of the delightsome beautiful, is with him a solemn service of a quasi-religious character; actually as if a sacrificial service; or it is not a work of Art, but an affront to Nature. Well, so let it be; such is emotional criticism; and emotional effort is meant to follow, and has followed—Emotional Art—Emotional Architecture—not for the builder, but for the emotional admirer. And we need not raise any objection; far from it; it pleases those whom it pleases. On looking closely at the other "lamps" it will be seen that they are of the same sympathetic type; the romantic illumination of a super-sensitive mind; all alike, not delusions, but amiable abstractions; you attempt to realise them and the light is gone if the lamp remains. Criticism on such bases is but the glow of enthusiasm; the calm analytical faculty only begins to act when this has cooled. Ruskin was a high priest of Nature; and that is enough. But what, then, is Nature in Architecture?

It is undeniably true that all that we call beauty and grace in the visible world must be the result of natural cause; let us say at once of material development; this is how it pleases the Divine to show "the garment thou knowest Him by." Therefore, as an example quite to the point, Nature—meaning the operation of natural law—is always genuine, "honest as the day"; and if a building could be so ordered as to grow out of the ground—from Nature's soil in Nature's air—like a tree in the forest or the well-known "primrose by the river's brim," it would of course follow, like them, Nature's laws; a great many of which, by the way, are mathematical, and all scientific; and not even Ruskin would dare to find fault with its organisation. Suppose, then, we look at the melancholy Forth Bridge, and ask the gentlemen of the Royal Academy, established by the State in great honour at Burlington House, what they think of it as a work of Art on the basis of Nature? They proceed to cast us out into Piccadilly.—But the gentlemen of the Royal Society, also established by the State in great honour at Burlington House, interpose on the way. It turns out that these two supreme authorities both understand all about "Nature." But, whereas on the one side of Burlington House our Forth Bridge is regarded with learned admiration as a beautiful—yes, they plainly say beautiful—example of "Nature unadorned, adorned the most" (scientifically), on the other side opinion is speechless with disgust (artistically). Now it is a curious fact that Architecture has always been held to belong to both those sides of Burlington House; so that an ideal architect, who cared about initials, might perfectly well be R.A. and F.R.S. together, and represent both interpretations of the term "Nature," which in fact has so many meanings that it may be said to have none. Seriously, then, with reference to Architecture in particular, is it not at the best an exceedingly inconvenient and illusory term? And may we not ask ourselves whether this is why it is so conveniently indefinite and illusive for any emotional purpose? The word is not really in the architectural vocabulary. Architecture is a thing so wholly artificial that it can be properly understood by none but the trained practical expert;—a dogma that ought never to be compromised under any circumstances. The principles of "Nature," in every applicable vague meaning of the word, are the principles of the artificiality of this Art, and it is only as such that they become architectural. Artistic building is architecture. Architectural art is the dress of scientific structure, grace for the multitude, finesse for the refined. Let those who wish to do so add sentiment for the sentimental, sympathy for the sympathetic, emotion for the emotional, and so let it be.

But are we to ignore the influence upon architecture of the sentimental diction, and the sentimental virtue which it expresses, of Ruskin's romantic writings? By no means. He has proved to be an ally of the greatest value, as an apostle of Art, however undefined. He had the characteristic of a popular preacher of the highest order; a favourite expression of his admirers is that he "touches the heart." Thus, even with relation to such a subject as architecture he gave a tone to public opinion. "Open your eyes," he cries, "and lift up your hearts!" And again, as if to throw over all inconveniences of argument, "Logic and rhetoric are only for fools and hypocrites"—not, that is, for you and me! As the highest principles of Art he names "Religion, National dignity, Noble sentiment, Enthusiasm!" He will not have dead art, but living—"the spirit of the Creator's work." All this in "bricks and mortar"? Yes, even in "bricks and mortar"! We have in these days and in this country quite enough of sober humdrum good sense all about us, and anything that now and then lets the steam of wisdom off pleasantly and harmlessly, if with a little exaggeration, is always to be welcomed.

This was the palpable secret of Ruskin's success. He must not be taken too seriously. He was wise and unwise together. His doctrines were no tame conclusions of ratiocination; they were pot-shots of spasmodic opinion and haphazard speculation, delivered at random as fancy happened to suggest, and contradicted when so it must be with a light heart. Perhaps it may be said that his life was a light comedy in which he played all the parts, grave and gay. In his study by the Lakes he was on the stage in London, and in the silence of the vale he heard the applause of a sensitive world, touched "to the heart." A man to be envied, not merely for his success, but for the unique worship that it brought. There is a whole world of good people in England who delight in the reading of his romances at this day, and whose children will succeed to their delight.

The influence exercised upon architects themselves by Ruskin's writings—the *Seven Lamps* and the *Stones of Venice*—at the time of their publication, was in one particular way very considerable. "The Battle of the Styles" was in full blast; on the one side the Neo-Classicists represented the usual practice of the Italian Revival, as that which belonged by natural law and by proper custom to the whole of modern Europe; on the other the Neo-Gothicists represented that progressive resurrection of the English Church which included a Revival of mediæval church-architecture. There was a certain sentimental element in Neo-Classicism in the form of an antiquarian "faith" in the (so to speak) supernal virtue of the Greek and Roman remains. There was an equally strong or even stronger archæological "faith" on the part of the Neo-Gothicists, resting on a patriotic acceptance of the "Old English" model of design. "Precedent" was the ruling divinity of both; on the one hand that of "the Five Orders," on the other that of "the Four Periods." The romantic mind of Ruskin having embraced the Gothic standard, thereafter his co-operation took a form of its own, and developed a romantic character of its own. In their daily practice of design the two antagonistic schools of architects produced work which was critically very bad art, and he allowed himself to condemn both to his heart's content; but he did not stop there. Pugin was enthusiastic and Parker was learned; Ruskin became intense. In the circumstances emotional intensity would acquire full force, and the brilliant expositions of its mysteries by an already famous writer on Art, not only arrested the attention of the best literary men, but commanded the special recognition of all intellectual experts. What the general public failed to understand they would consent to pass by; but what the experts might feel compelled even to smile at they agreed to admire as acceptable romance; and thus the suggestions of the Emotional acquired an actual authority which was beneficial.

Ever since those days, young architects have been reading Ruskin; some thoughtfully

and some not. The practice of design and the principles of criticism have changed, but the phenomena of the Emotional, first appearing in his books, appear still in the aspirations of the romantic mind. At the present moment, many will say, the fashion of artistic architectural work is not of an elevated character; there was formerly, in the best work, a certain serene refinement, alike in the "Orders" and in the "Periods," a lofty, vigorous, vivid aim, an intellectual restraint and repose, which compels comparison with a now prevalent sensationalism and a crudeness not to be denied. Ruskin would have had a word to say on this. But we have not here to discuss to-day's drawbacks of our own, our task has been to contemplate over the grave the life's work of a striking personality, to confirm the generous appreciation of eminence, and to honour the remembrance of good service, conscientiously, courageously, and brilliantly rendered to our Art.

A final word:—we have here a strange, wayward, miscellaneous Impressionist; whatever he touched with his pen became instinct with life, and song, and glow—spiritualised, etherealised, electrical.

CONCRETE FLOORS.

By Frank Caws [*F.*], Vice-President Northern Architectural Association.

[*Read before the Northern Architectural Association at Newcastle*, 14 *Feb.* 1900.]

WHEN I engaged, by wish of the Council, to give this lecture, I little thought that we, as an Association, were going to be burnt out, and that this lecture would be the first one delivered in premises temporarily obtained in consequence of fire. I am sure we are all very glad that our valuable Library escaped the fire, and I hope the issue will be that we may find permanent quarters better than those from which we have been burnt out. It was my intention to have commenced my remarks by insisting upon the importance of an architect using his influence with his clients, upon all occasions as far as possible, in favour of fire-proof construction; and the practical illustration which we as a Society have now before us, will serve to emphasise my contention, which is that in these days to build non-fireproof dwellings should rank as a misdemeanour, not to say a crime. Time was when all London houses were built of wood. Then came the Great Fire, after which brick walls were insisted upon. This was one important step in the right direction; but up to the present, in the case of dwellings, this step has not been very much advanced upon. It is true that in buildings of a costly character, such as banks, picture-galleries, theatres, museums, and so on, very considerable advance has been made in the direction of fire-proof construction, but not in respect of buildings in which the risk of fire concerns human life rather than valuable property. It would seem from this that Englishmen place a higher value upon property than upon life. I do not myself believe for one moment that such is the case, for we are not living to-day under laws which permitted the hanging of a man for stealing a sheep.

The question of fire-proof dwellings is one of ways and means. It must be obvious that, if by making buildings fire-proof we make them so much more expensive that people in general cannot afford such costly houses, it is better to have a non-fireproof dwelling than no dwelling at all.

But I am convinced that, thanks to that modern introduction—Portland cement, it is quite easy to construct fire-proof dwellings at such slight additional cost to that of non-fireproof dwellings, that there is no proper excuse now remaining for those who continue to favour the latter.

The question of the best method of fire-proof construction is a very debatable one, and relates more particularly to floors and roofs. There are so many patents in connexion with fire-proof building construction, that for me to attempt in one brief lecture to deal with them would be vain. It is natural for everyone financially interested in some particular method to advocate it and press its claims, and I think it may safely be left to such gentlemen each to push his own speciality. But I have no interest whatever of that kind, and I shall content myself with telling you, my fellow architects, in as brief and simple a way as I can, what my experience has led me to adopt in my own practice, and you will judge whether the method I employ is good enough and cheap enough to meet the requirements of such cases as you yourselves may be called upon to deal with.

It was about twenty-two years ago, when I was enjoying my summer holiday in the Isle of Wight, that I was recalled by wire to Sunderland, by my friends Messrs. Pearman and Corder, wholesale grocers and provision merchants, to assist them in settling with the insurance company for the total loss by fire of their large warehouses in the middle of Sunderland. It was a very awful fire, and one which might have had terrible consequences upon the surrounding buildings in that crowded locality, and my clients were impressed with the necessity of making their new buildings fire-proof if possible. I had had no previous experience of fire-proof construction, and upon approaching the problem I found a serious difficulty, which was, that it would not be possible, with the financial means at our disposal, to erect new buildings by any of the expensive methods of fire-proof construction which were then in vogue. The necessities of the case induced me to give an amount of earnest thought to the question of the strength of concrete slabs. It was an extremely difficult subject to grapple with, because, though I searched in many directions, I found no authoritative data to guide me. The most valuable book which I at that time studied was Grant's book on "Cements." But this book gave me no indication as to what size of slab I could safely adopt, and I therefore had to think the matter out for myself.

Now, it was plain to me from the very begin-

ning that, apart from the question of cost, the introduction into concrete floors of large masses of iron girders—there were no steel girders in those days, but the same remark applies to steel—is in itself calculated to impair the fire-proofness, because iron is a material which expands under heat to such a degree as to tend, during a fire, to destroy the floors which it would be intended to strengthen. I therefore determined on this account, but also with a view to economy, to do with as little iron as possible. At this time I began to think about the differences of strength between a slab resting upon its two ends like a beam, or on its four edges, and I was able at once to discover in this difference a principle which, if rightly applied, might prove of inestimable value in solving the practical problem with which I was confronted. I took from my mantleshelf a little framed carte-de-visite, and, removing the glass and the card, I placed the frame flat upon the table and laid the card crosswise over it, resting on its two ends like a beam. Upon the middle of the card I piled a few coins as a load, and increased the pile until the card bent down and touched the table. I then tested the strength of this same card as a slab, by simply placing it back upon the ledge of its frame, so that all its four edges were supported. Again I loaded the middle of the card with coins, the same number as before, without making any visible deflection; and I found that I had to increase the load very greatly to induce the card to bend so far as to touch the table; and indeed, in doing so, it became necessary to seriously buckle and injure the card in a way that the mere bending of the first experiment did not. I then began to think of trying similar experiments with glass, because it struck me that glass, being of a hard, brittle nature, was more akin in this respect to concrete; but, upon reflection, it occurred to me that I need not make any actual experiments with glass, for every window-pane subject to a strong wind pressure was mechanically in the condition of a floor-slab resting on its four edges. Then I remembered also the glass counters of tobacconists' shops, how very strong they seemed to be; and last, but not least, I thought of the huge plates of plate-glass in our modern shop windows, and of the great amount of wind-pressure which they proved capable of resisting.

Of course, I saw that glass as a material is much stronger than the best cement-concrete, and on looking into tables of the strength of materials, it seemed that glass might be taken as about five times stronger than concrete. Taking a plate of shop-window glass 10 feet square, under a wind pressure of 20 lbs. per square foot, we have a slab of 100 square feet carrying a distributed load of 2,000 lbs. A slab of concrete 10 feet square would, of course, be much thicker than the glass. Say the glass is $\frac{1}{4}$ inch thick, and a slab of concrete is 4 inches thick, we know that the strength will vary as the square of the thickness. Now 4 inches is sixteen times thicker than $\frac{1}{4}$ inch, and 16 squared is 256, so that if the concrete were as strong as glass, it would carry 256 times 2,000 lbs. load. But on account of the concrete being only one-fifth of the strength of the glass, you must divide 256 by 5. Thus we reach the conclusion that a concrete slab 4 inches thick will carry 51 times the load, say 50 times in round numbers, of a glass plate of the same size but only $\frac{1}{4}$ inch thick. According to this computation, our concrete slab 10 feet square and 4 inches thick will carry 100,000 lbs., that is 1,000 lbs. per square foot of surface equally distributed, or say about 9 cwt. per square foot, including its own weight. Upon this mode of reasoning I proceeded to make sundry experiments, and also collected from many sources such data in regard to the proved strength of concrete bridges and floors as tended to confirm the principle of comparison, and eventually I proceeded with the floors of Messrs. Pearman & Corder's new warehouse, and constructed about 1,800 tons of concrete flooring in large slabs about 13 inches thick, many of which were about 21 feet long by about $12\frac{1}{2}$ feet wide, without any iron in them. When the work was far advanced, and before the centerings were removed, Mr. Pearman remarked to me that many practical people thought that both he and I were mad, and it was generally expected that when the centering was taken away the slabs would fall by their own weight. These evil predictions, however, were falsified, and during the last twenty years these floors have been in constant use, subjected not only to heavy loads, sometimes amounting to 5 cwt. upon the square foot, but also to the impact of falling weights, and to the rough-and-tumble work of a heavy goods warehouse, as well as to the vibration—which is very trifling—of a powerful Otto gas-engine on the upper floor, four stories above the ground. Several fires have occurred in this building since it was completed, and in each case the damage done was very insignificant; although, had the building been of the ordinary non-fire-proof character, it would have been probably wholly or partially destroyed.

I need hardly tell you that I was gravely impressed during the carrying out of this work with the heavy responsibility involved in the adoption of concrete slabs of such large sizes without iron, and I should not have felt justified in assuming that responsibility had not the financial necessities of the problem demanded it. These floors were constructed at a cost far below what would have been the cost had I followed the method of construction at that time most approved of; and I believe these floors are more fire-proof than they would have been had I introduced a considerable quantity of iron.

In committing myself to this grave under-

taking, I attached due importance to the time element.

In these days of hurry, both clients and contractors are always too ready to remove the centering before the concrete has properly set, but I was exceedingly careful to prevent any centering being struck within five weeks of the slab being cast, and in most cases the time allowed was considerably more than five weeks.

In this building the walls were carried up to their full height before any floors were cast. The top floor, which was the roof-flat, was cast first, and when it was set the same centering was used for the lower floors, one after the other, which, while economising the cost of centering, of course added to the slowness of the progress. This is a method which I would never adopt of choice, as I consider it subjects the work to serious disadvantages. I greatly prefer to cast the floors upon the walls as the building rises, and to use a separate centering for every floor, and in many of my subsequent works I have adopted this method, but one cannot always do as one likes in such matters. At Pearman & Corder's buildings we obtained the necessary rests for the slabs upon the walls by building courses of brick in sand at the floor edges, which courses could be easily removed in short sections as fast as the concrete was ready to take their places. That is a method which is perfectly safe, like underpinning, if carefully executed, and though I have never experienced any ill effects from it, there is always the "if," which should, if possible, be avoided.

Perhaps, before proceeding further, I ought to describe the nature of the concrete used on this occasion. It consisted of one part of Portland cement, manufactured by Messrs. Grimshaw of Hylton, and four parts of good hard broken brick, turned over twice dry and twice wet, using the water as sparingly as possible. I am an advocate of broken brick as the best aggregate for concrete for such floors, because, having passed through fire, brick is already fire-proof, differing in that respect from broken stone or gravel. I have also found that broken brick is a substance of approximately equal strength to Portland cement, which is proved by the fact that when such concrete is broken up, the fracture extends alike through both the brick and cement, but when hard flint gravel is used instead of brick, the fractures leave the individual pieces of gravel intact, while the broken concrete has the appearance of cement gums, so to speak, from which the gravel teeth have been withdrawn. This is particularly true when the gravel used is of a smooth and rounded kind; moreover, the hard smooth gravel surface has no suction for the cement like the porous surface of broken brick. I am aware that various kinds of breeze are often used as aggregate in concrete floors, it being argued that this material makes the concrete much lighter; but I should hesitate to construct large slabs with breeze aggregate, as I do not think it would be equal in strength to concrete with broken brick aggregate, and as to the weight of the latter I consider it no drawback to a properly constructed building with good and sufficient foundations. Breeze aggregate may, however, be usefully employed for any parts of the floor or ceiling into which it is desired to drive nails. But my practice has been to embed breeze bricks in the concrete for such a purpose in the proper position where required for nailing.

I have particularly mentioned Pearman & Corder's building, not because it is the best or boldest example of slab floors which have been constructed under my care, but because it was the first.

Subsequently I have been engaged on many concrete floors, in all of which I have adopted the slab principle successfully, varying the mode of construction in sundry details which the special requirements of each case and further experience suggested. I have always been particular to obtain rigid, strong centering, and I cannot too emphatically caution my fellow architects as to the importance of this item. Any attempt to save money by scamping the centering is likely to lead to trouble and prove very false economy.

The greatest difficulty in dealing with cement-concrete floors is due to the natural expansion which the material undergoes in process of setting. This expansion is much greater when the cement is new and hot than when it is old and cool. It is not, however, the expansion itself which causes the trouble, so much as the smaller degree of contraction which follows expansion in the process of setting. This contraction causes cracks, which frequently occur over the supporting girders where the concrete is generally thinnest. These cracks have really no appreciable effect upon the strength of the concrete, but all the same they are apt to cause uneasiness and want of confidence in the minds of those who do not understand what they are occasioned by. By using carefully selected cool cement, and by taking certain precautions as regards the size of the slab and its mode of casting, the shrinkage can be so minimised as to almost entirely avoid such cracks.

I would like to point out at this stage, that I consider sand a most improper material to mix with cement in concrete floors; in fact, I regard it as poison to the cement, and have never allowed its use since the discovery I made at the early stage of my experience as to its bad effects.

The fact is, if a very fine sand be used, instead of helping the cohesion of the concrete, it tends to disintegrate it, so that, when sand is employed to give the necessary smoothness to the finishing of the upper surface of the cement-concrete floor,

the surface, when subjected to the traffic, is likely to scrape off, and give off sandy dust, and eventually present a very shabby appearance; therefore, I have found it best to employ, in finishing the surface, fine crushed granite instead of sand.

Of course the surface of the slab should always be put upon it while the body of the casting is still comparatively wet, but it is hardly practicable to put the surface on in one and the same heat with the casting of the slab. In fact, it generally has to be done as a separate operation, and though it is desirable to have it done on the very next day after the slab has been cast, it is not always possible even to secure that arrangement; and it ought not to be overlooked that, whether the surface be put on immediately after the casting or some time later, the surface—which should generally be about an inch thick—can never be made absolutely homogeneous with the under bed. For once the latter is allowed only a few hours to set, the film of air resting upon it is never entirely expelled by any layer afterwards superimposed, and this air-film constitutes a real division between the under bed and the surface. Therefore, in reckoning the strength of concrete slabs the architect should not rely upon the entire thickness, but only upon the thickness of the under bed; so that, for example, in a slab whose total thickness is seven inches, including a one-inch top coat, the architect should consider the effective thickness, as regards strength, as six inches only.

One of the most remarkable features about cement-concrete floors is the great density of the concrete at its under surface, due to the fact that the liquid cement naturally gravitates to the lowest level, leaving the grosser aggregate above it, so that the wood-centering when removed leaves upon the ceiling an exact impression of every plank, such that the grain of the wood is distinctly traceable upon the under surface of the concrete slab, the extreme hardness of which makes it difficult for an ordinary plaster ceiling to be rendered beneath it without running the risk of the plaster falling down, as the hard cement surface has little or no suction to afford the plaster a key, or hold.

There are various methods of overcoming this difficulty, all of them more or less costly. In one of my most expensive buildings I determined to do without the plaster ceiling, and to obtain a perfectly smooth surface to the under-side of the concrete floors by which the plaster would be rendered unnecessary. Accordingly I set the plasterer to work to cover all the wood centerings with a skin of plaster, floating it very true and smooth, and so instead of casting the concrete upon bare boards in this instance, I had it cast upon a prepared plaster matrix. When the centering was taken down the plaster came away with it and left the cement surface as perfectly level and smooth as could be desired; but, alas! the colour of the material being dull, mottled, and unpleasant, and having none of the light-giving quality of the white plaster ceiling, we had no alternative but to paint or paper these cement ceilings.

Another method which I have tried more recently and very successfully in plastering under concrete slabs, is to render them, after the centering is taken down, with a coat of Portland cement and sand, which I find adheres well, and upon this coat I finish with a skimming coat of fine plaster.

In making fire-proof floors for cottages I consider if proper care were taken in the centering, and the joints therein covered with narrow strips of lining paper (to prevent the cement grout from descending into the chinks), it would be better to do without plaster ceilings altogether, and be content with the natural impression of the wood upon the cement, whitewashed. By such means, and also by avoiding needlessly thick slabs, the expense of cement-concrete floors can be brought within such limits as to render the fire-proof dwelling of a working man cheap enough to be a good commercial investment.

During all the years in which I have been interested in fire-proof construction I have grown increasingly impressed with the fact that the greatest field open for the ingenuity and skill of the architect and builder, is to be found in the direction of providing fire-proof dwellings for the people at small cost, in lieu of those match-boxes which are now multiplied by the thousand in our large cities in apparent defiance of all desire of improvement, and in utter disregard of danger to human life.

Although a fire-proof dwelling must cost more than a non-fireproof one, it will pay best in the end, because it does not decay or fall into disrepair, but, where ordinary care is used, is practically everlasting. Moreover, it is vermin proof, and cleaner and more sanitary than buildings containing many hidden chambers and cells of decaying timber, and ever gathering dust.

The limitations as to the size of cement-concrete floor-slabs, are largely determined by the quantity which a gang of men can cast in one day. If the slabs are made unduly large, it is highly probable that some of them may be left by the workmen half finished overnight, the other half being added next day, consequently leaving a joint right across the slab, which, though by no means fatal to its strength, is extremely undesirable.

In designing a large expanse of flooring it is necessary, therefore, to subdivide the area into squares of reasonable extent, and I may say that, in my own practice, I consider a square of about 150 superficial feet a reasonable size to arrange for, although in some cases I have found it necessary to make them much larger.

The steel girders which form the divisions be-

tween the slabs should be made strong enough to carry the weight of the slabs themselves and of their greatest proposed loads; but it must not be supposed that, when the slabs are set hard, these steel girders will necessarily be called upon to wholly sustain these weights.

I say necessarily, for much depends upon the manner in which the girders are placed. For example, if the girders are placed entirely or mainly beneath the concrete so that the full thickness of the slab, or a considerable thickness of it, passes above the top of the girder, as shown by fig. 1; and if in such a case the casting of the

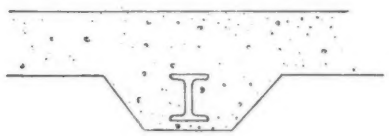


Fig. 1.

slab be performed in one heat, or as nearly in one heat as possible, which can be done by organising a sufficient number of working gangs—in this case the whole floor, consisting of numerous squares, may be regarded as one homogeneous slab, which is therefore so largely self-sustaining that, when once it is set, it brings but very little of its weight to bear upon these girders, which apparently support it.

But if, as an example of another method, the girders be placed so that their tops are bare or else covered by a thin surface of concrete, as

Fig. 2.

shown by fig. 2, the girders in this case practically cut the various squares asunder, so that each square naturally must bear wholly upon the girder.

It will be obvious from these two examples that the former method, upon the score of strength, is distinctly preferable, though sometimes circumstances compel the use of the latter method; and whichever method is employed, it is always wise to make the girders strong enough to bear the entire weight, though they may never be called upon to do so.

You have all heard the story of the gentleman who advertised for a coachman, and when three applicants presented themselves he examined them, one after the other, in this way. He asked the first man, "How near can you drive to the edge of a precipice?" "Within a yard, sir." The second said, "Within an inch." The third replied, "I should keep as far off as possible, sir." "You are the man for me," said the gentleman. It would be rather alarming if in our designs we were even to approach the possibilities of strength in very thin concrete slabs; and if we were to establish our practice upon the minimum, I am afraid we should get very few clients.

We therefore, as architects, should be extremely careful in our work to allow a large excess of strength; but we should be likewise able to distinguish between a mere excess of strength and an excess of cost, at the expense rather than the gain of strength.

For example, if we introduce into concrete floors a large number of steel joists or girders so arranged as to cut the various sections asunder, the chances are that the cost of all this steel work will result in weakening the flooring as a whole, and certainly in rendering it less fireproof. If, upon the other hand, we were to construct an extensive floor-area of a large warehouse of one vast slab of concrete, with absolutely no subdivisions and no supporting girders, we might be charged with the same want of caution as the coachman who boasted of his being able to drive within an inch of the danger.

Between these two extremes I have endeavoured in my own practice to find a happy medium, consistent with economy and also with caution.

Notwithstanding all the care we may take, we are liable to accidents occurring from unforeseen causes, such as subsidence of foundations, vibration due to machinery either in the building itself or in the adjoining works, or to carelessness of workmen, both in casting the slabs and in erecting or removing the centering, also from inferior cement, which may be supplied in spite of every precaution. Therefore I consider, if we can obtain at small cost our auxiliary strength without reducing the fire-proof quality of our floors, we shall be well advised to do so.

The use of expansible metal lathing laid down upon the centering as the base on which the slab may be cast is undoubtedly an excellent precaution, but is unfortunately a rather costly one.

At one time, with a view to such precautions, I employed small iron rods embedded in the cement near its under surface; but my latest practice has been to stretch upon the top of the centering, before casting the concrete, galvanised iron wire sheep-fold netting, which costs very little, and certainly adds great reserve of strength to cover such contingencies as I have named.

I also find it very advantageous to lay down loosely upon top of this netting extremely light thin bars of angle or tee section, about three feet apart, which make very trifling addition to the cost of the floor, and afford still further safeguard, tending to check any movements of the building by binding the whole structure well together.

Some people think that cement floors are too cold, and accordingly cover them with wood, which, of course, involves a very great addition to the cost, having nothing but the sense of comfort to recom-

mend it. For my own part, I think that a cement floor covered by a good cork-carpet is far preferable, and quite comfortable.

However well-seasoned wood-flooring may be, the boards will shrink, and when the floor is washed the moisture between the chinks cannot get away or be evaporated without, in time, tending to produce an undesirable state of mildew or decay. I am not arguing against parquetry floors laid upon a special glue, but I am dealing with floors of a more economical character suitable for ordinary dwellings.

Everyone recognises the danger attached to the premature removal of centering from concrete floors, of which we have had in the building world not a few lamentable examples; but there is another danger, not so generally recognised, which, with your permission, I should like to point out, namely, that of a too *sudden* removal of centering. Although the concrete may have had plenty of time to set, we must remember that its weight is resting upon the centering, and that when the centering is removed the slab must bend, however inappreciably, before it can become self-sustaining. The same thing is true of a wide-span masonry arch of any bridge, so that no contractor or engineer would ever dream of permitting the centering of such a bridge to be suddenly removed without first easing the wedges which sustain it.

Although the vertical movement of the mass of a slab in settling is generally too small to be measured, yet this slight movement involves the momentum of that great mass, which momentum may be sufficient seriously to damage, if not to wreck, the slab. It is, therefore, absolutely imperative that the wedges sustaining the centering of concrete floors should be carefully eased, and the centering allowed to stand a day or two afterwards, and the wedges should be then examined, and not till they are proved to be quite loose should the centering be taken down.

It was my intention to have stated at the outset one or two considerations in regard to relative strength of beams and slabs which by the aid of diagrams I may be permitted to explain now. Here (fig. 3) is a beam 10 feet broad, 1 foot deep, and 10 feet span. The effect of an equally distributed load, including the beam's own weight, can be shown, if we represent the load, as subdivided into two halves, by two arrows. The arrow A represents that half of the load which is carried by the support B, and the arrow C likewise represents the other half of the load carried by the other support D.

It will be seen that each arrow is placed at half the distance from the support to the centre of the span, so that the equally distributed load, which has its own centre of action there, acts with a leverage of $2\frac{1}{2}$ feet, that is a quarter of the span. Now let us suppose that this same slab is supported not only at its two ends, but also at its two sides, that is all round its four edges, each edge sustaining a quarter of the total load. If we draw

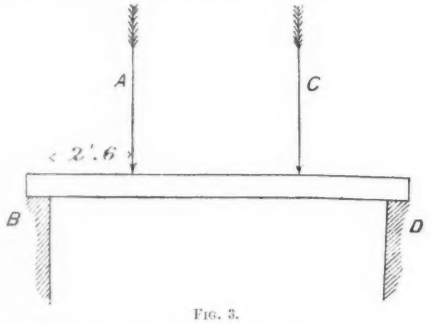


Fig. 3.

diagonals across the span of the beam, as shown by the dotted lines on fig. 4, we see that each edge carries as much of the load as is represented by each triangle, that is one-fourth. But the centre of the load equally distributed upon each triangle occurs at the centre of the area of that triangle, which is not 2 feet 6 inches from the support as

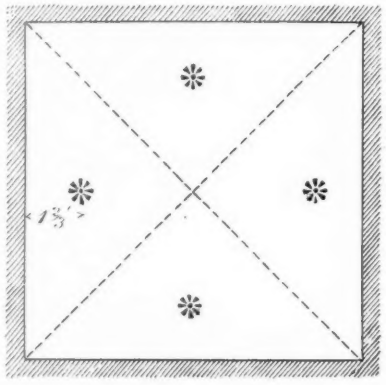


Fig. 4.

in the case before-mentioned, but $1\frac{2}{3}$ feet therefrom. Thus, then, by allowing the square slab to rest on its four edges instead of on two only we reduce the leverage of the load from $2\frac{1}{2}$ feet to $1\frac{2}{3}$ feet, while at the same time we reduce the load itself acting upon each bearing edge from the $\frac{1}{2}$ to $\frac{1}{4}$ of the total load.

And thus we have in the first case $\frac{1}{2}$ multiplied by $2\frac{1}{2}$, that is $1\frac{1}{4}$ measure of stress, while in the second case we have $1\frac{2}{3}$ feet leverage multiplied by $\frac{1}{4}$ of the load, yielding only $\frac{4}{10}$ measure of stress, which means, in short, that a square slab bearing on its two edges under a given distributed load is stressed three times more intensely than the same slab under the same load supported on

its four edges. In other words, a square slab supported on its four edges is three times as strong as when supported only on its two opposite edges. We may from this example jump to the general conclusion that rectangular slabs resting all round their edges are always three times as strong as beams of span equal to the slab's *length*, but in point of fact the difference between the strength of long narrow slabs bearing upon all their edges and of beams whose span equals the slab's *length* is much greater than would thus appear.

Suppose, for example, we were to test a concrete beam 1 foot deep by 1 foot wide by 10 feet span, we should find it would break under a comparatively small load; but if that same beam were supported along its sides as well as at its ends, three times the load which would break the beam of 10 feet span would utterly fail now to produce any visible effect upon it, and, indeed, we should find it practically impossible to break it by any load at all; for it would in truth be three times stronger than a beam of 1 foot span. The fact is, in comparing the strength of beams to that of oblong slabs, we must consider the *narrower* span of the slab as representing the span of the beam; and then it will always hold good that the slab is three times stronger than the beam, as before explained.

The text-book rule, that the strength of beams varies as their width, does not always hold good. For example, suppose that we were to compare the weight which would break the 1 foot deep by 1 foot wide concrete beam of 10 feet span with the weight which would break a concrete beam 1 foot deep by 10 feet wide by 10 feet span, we should find that the 10 feet wide beam would carry without breaking much more than ten times the weight which broke the 1 foot wide beam.

But the text-book principle, notwithstanding its limitations, reasserts itself when we come to apply it to the cases of beams of extraordinary breadth. If, for example, we consider the case of a concrete corridor floor 10 feet wide and 100 feet long, supported along the walls upon both sides, but having its extreme ends unsupported, we may regard it as a beam 100 feet wide of 10 feet span. Now we know that if we were to chalk out a 10 feet length in the middle of that corridor, that portion would bear one-tenth of the load which the 100 feet would sustain. Furthermore the 10-feet section thus chalked out would bear the same load as if the floor were supported by walls at the extreme ends, though there are no walls there, because the edges, so to speak, where the chalk marks are are supported by the adjoining edges of the corridor floor, and that portion which we chalked in the middle of the length of the corridor is thus practically in the same condition as a slab having all its edges supported.

The fact is, the effect of walls supporting the extreme ends of the corridor floor would not be felt throughout the entire length of the floor, but only for about 5 feet from each end, as their supporting effect extends in a triangular fashion

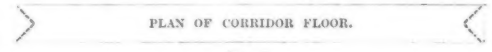


FIG. 5.

limited by the two mitre lines as dotted on this sketch, fig. 5.

It will thus be seen that a large expanse of slab flooring has the remarkable principle of self-support to which the ordinary rule for gauging the strength of beams can apply only subject to important limitations.

Reverting to the case of girders which are beneath the level of the concrete slabs which they support, I must point out that it is very necessary that these should be protected from fire by being encased in solid concrete.

The largest slabs which I have carried out, I think, in my practice are about 33 feet long by some 17 or 18 feet wide by 7 inches thick. I have done many of about that size, all of which have proved quite satisfactory, but, as before said, I prefer, as a rule, to make them smaller.

As regards floors of ordinary cottages covering small rooms, no steel joists need be used, but I would introduce wire netting and the light steel bars before mentioned, and in such cases the floors need not be more than 6 inches thick, and I am satisfied that if proper care were used in mixing and casting and so on, a 4-inch thickness would suffice, for slabs not exceeding 12 feet span.

Referring to the sketch fig. 6 [see next page], for any given thickness of concrete, the stress of square slabs due to their own weight and to their distributed loads is, for reasons already stated, always proportional to their areas, multiplied by one-sixth of their span. Thus, if we know that, as shown by fig. 6, a slab of 10 feet square by 4 inches thick will carry safely a load of 9 cwt. per square foot, we may conclude that a 4-inch slab 5 feet square would carry a load of 72 cwt. per square foot; and similarly a 4-inch slab of 20 feet square would carry safely a load of 1¼ cwt. per square foot, including its own dead weight.

The greatest stress of a square slab occurs at the mitres nearest the wall bearings.

I had a slab without wire webbing, 20 feet square by 6 inches effective thickness, broken along the mitres when five weeks old by the sudden removal of the centering through neglecting to ease the wedges. That slab was still green. Had it been bone dry, and its centering cautiously relieved, I think it would have safely sustained a load of 2½ cwt. per square foot, that is about 2 cwt. per foot over and above its own dead weight.

Heavy tail-weights of walls on concrete slabs resist movements of expansive force, and tend to improve the strength of the concrete not only by the counter-leverage due to encastrement, but also by the compression thus induced, so that the lower floors of a building of many stories high generally show fewer contraction cracks than the top floors do.

When the centerings are first removed, the under surface of the slabs from which air has

Fig. 6.

been excluded are invariably damp, or, as the technical term has it, "green," like stone cut fresh from the quarry. Exposure to the air dries and hardens the concrete, and the general strength and rigidity due to this drying are so great that I consider slab floors three months after removal of their centering, are probably about three times as strong as at the beginning of that three months.

Seeing that the stress of slabs under uniformly distributed loads is proportional to the cube of their span, it will be obvious that great reduction of stress is obtainable by forming the slabs with coved edges as shown by fig. 1 on a previous page. Suppose, for example, we are dealing with slabs about 12 feet square, similar to those I have recently had cast at Messrs. Swan & Hunter's new offices at Wallsend, and we reduce the flat part to 10 feet square by means of our cove, the greatest stress is reduced accordingly as from the cube of 12 to the cube of 10, that is about 24 per cent., and at the same time these coves serve to enclose the steel supporting-girders, thus protecting them from fire.

If time permitted there is much more I might have said on the subject, not only regarding concrete floors, but also as to concrete roofs, which, from a fire-proof point of view, are certainly not less important.

Thus far my remarks have been so discursive that I feel it necessary, in closing this lecture, to focus, in the form of general rules, some of the conclusions to which twenty years of special experience have led me in regard to the construction of concrete slab floors.

1. To take pains to obtain old cement. 2. To use good broken-brick aggregate, and not sand, in the proportion of four of brick to one of cement for the body of the slab, and fine crushed-granite without sand for the surface coating, having about three of granite to one of cement. (I may say I have found that when the surface coat is gauged two of granite to one of cement, it sets too soon, while the continued expansion of the body beneath is still going on, and this causes minute cracks, tending to deface and spoil the surface.) 3. To adopt, as precautionary provision, sheep-wire netting as the base, and steel angle or tee bars weighing not more than 1½ lbs. per lineal foot, spaced about three feet apart on the netting. 4. To consider a slab 10 feet square by 4 inches thick as capable of sustaining a load of 9 cwt. per foot including its own weight, and to reckon that every slab will bear per square foot more or less than 9 cwt. directly in proportion to the square of its thickness, and inversely in proportion to the cube of its span. When the slab is rectangular the minimum span has to be considered the span. 5. To avoid casting slabs in frosty weather. 6. To insist upon organising the gangs of workmen so as to cast as large an area of slabs as possible in one heat, and never to allow a slab to be left overnight with its area only partially cast. 7. To insist upon strong centering, and to keep it all standing not less than five weeks after the last slab of the series of one flat is cast, and absolutely to forbid and prevent the sudden and careless removal of the centering.

In conclusion, you must please understand that in making no reference to many other methods of concrete-flooring which are more or

less successfully practised, I have no desire to cast any reflection upon them, but have thought it best to confine my remarks to my own experience, and to speak the things which I know rather than those of which I have heard.

Thirty years ago Messrs. Pedder and Brannon, architects, erected near the gas-works at Hendon, Sunderland, two concrete cottages, which, after completion, they filled with straw and other combustibles, and, in the presence of a company of well-known Sunderland townsfolk, set fire to. No visible damage resulted at that time, and the cottages have been occupied by tenants, I believe, ever since. A few weeks ago the present proprietor took me down to inspect them. I found them in excellent condition, in fact as good as ever they were. The working people occupying them are paying good rents, and the proprietor is about to build four similar fire-proof cottages adjoining, plans for which have been recently approved by the Sunderland Corporation.

The test of a fierce fire and of thirty years' subsequent wear and use, permits no other conclusion than that fire-proof cottages for the people can be built cheaply, substantially, and sanitarily. And in this case the proprietor finds little or no main structural repairs needed after thirty years of rough use.

Gentlemen, I think we shall all do well to lay these facts to heart, and to do, each of us, what we can to help bring about a great reform in the shape of fire-proof homes for the common people.

Discussion.

Mr. Frank Rich [*F.*] proposed a vote of thanks to the lecturer, and, after referring to the boldness of his various concrete works, said he should much like to know to what extent steel joists and girders were stiffened and strengthened by being enveloped in concrete. This question was seriously discussed during the erection of the Durham College of Science, and Dr. Garnett, as then Principal of the College, intended making experiments thereon. But since Dr. Garnett had been called off to advise the London County Council on technical education, nothing had been done with those experiments, and Mr. Rich contended that the Royal Institute of British Architects would do well to undertake them. In his own practice he economised the scantlings of girders which were to be encased in concrete; for though, in the absence of experimental data, he could not presume to say how much additional strength girders derived from such encasing, he was quite satisfied the gain of strength is considerable.

Mr. Joseph Oswald [*F.*] seconded the vote, and expressed the satisfaction with which he had listened to the lecture, and more especially to the lucid explanation of the effect of various sizes of slabs on their strength, as shown by the diagrams. He would like to know the gauge and size of mesh of the wire-netting employed by Mr. Caws.

Mr. Bruce said he would like to propose that the paper should be printed, so that all might study it.

Mr. Glover [*President N.A.A.*] in putting the vote remarked that he had much enjoyed the lecture, as it was so thoroughly practical. He added, that as the lecture would appear in the R.I.B.A. Journal, that would meet Mr. Bruce's requirement.

Mr. Caws, in replying to the vote of thanks, gave an interesting actual illustration from his own practice of the relief to a girder from the stiffening of the concrete. He said the wire-gauge of the netting was thirteen, and the size of the mesh 3-inch. The netting cost about 4*d.* per square yard nett, and 6*d.* per square yard fixed.

Mr. Rich remarked that he was at present constructing some concrete floors designed to bear one ton load per square foot.

Mr. Caws asked the price per square yard complete.

Mr. Rich replied, "About a pound."

Mr. Caws congratulated Mr. Rich upon having clients willing to erect fire-proof floors at such cost.

Several members demurred slightly to the lecturer's condemnation of sand, but Mr. Caws, while admitting that his objections applied with less force to coarse sand, restated his dislike to fine sand, giving actual instances of its ill effect on floors which had come under his own observation. He pointed out that, during the process of setting, the cement crystallises into a granular substance which, if its grains be coarser than those of the sand employed (as they quite easily may be), then the sand is not bound by the cement, but tends rather to wedge between and disintegrate the cement grains, preventing them from adhering to each other. And, as he could not be sure of getting specially coarse sand, he preferred to discard sand entirely, and go in for crushed-granite instead.

Mr. Rich remarked that, as concrete buildings are air-tight, special care is required in planning them to make adequate provision for ventilation; and Mr. Caws said his own experience certainly bore out the truth of this observation, the importance of which could not be too strongly urged.

The President, in concluding the meeting, said the informal conversation which had followed the vote was interesting and useful to everyone present. Such mutual interchanges of experience were always helpful to fellow-architects.

9, Conduit Street, London, W., 10*th March* 1900.

CHRONICLE.

The Royal Gold Medal 1900.

The Special General Meeting convened for the 5th inst. to elect the Royal Gold Medallist for the current year was duly held, and resulted in the election of the distinguished gentleman nominated by the Council—viz. Professor Lanciani, D.C.L. Oxon. [*Hon. Corr. M. Rome*].

Special Election to Fellowship.

At the Business Meeting last Monday it was announced that at the Meeting of the Council held that day Mr. Edward Augustus Ould, President of the Liverpool Architectural Society, had been elected a Fellow of the Royal Institute under the proviso to By-law 9.

The New Street from Holborn to the Strand.

In the course of the proceedings at the Business Meeting last Monday Mr. Wm. Woodward [*A.*] asked leave to call attention to a statement in the draft Report of the Improvements Committee of the London County Council, printed in *The Builder* of the 24th February under the heading "Architectural Features of Holborn to the Strand Street"—viz. that the conditions of the scheme for obtaining designs for the elevations of buildings in the new street had received the full approval of the Institute Council. Mr. Woodward then referred to the President's letter in *The Builder* of the 3rd March publicly disavowing such approval and pointing out that the statement in question was entirely without foundation. The matter, Mr. Woodward insisted, was of such moment that he trusted the Council would afford the Meeting the fullest information they were in a position to give as to what had taken place. The Chairman, in reply, stated that the subject of Mr. Woodward's question had been before the Council at their meeting that afternoon. The Council, as the President had pointed out, had never been officially approached respecting the details of the scheme. There had been some misunderstanding, which he believed would be set right in the Revised Report of the Improvements Committee. As regards the details of the competition, the Council were moving in the matter; they had every desire to co-operate harmoniously with the London County Council, and every hope that such co-operation would result in a satisfactory scheme.

Alteration of By-laws respecting the Constitution and Election of Council.

Pursuant to notice, a Special General Meeting was held at the conclusion of the Business Meeting last Monday, to receive, and decide for or against the adoption of, the recommendations of the Council respecting alterations in By-laws 25, 29, and 30, as printed in the paper convening the Meeting—viz.:

1. That in By-law 25 the words "thirty-six" in the first line be altered to "thirty-eight," and that the word "two" in the second line of section (*a*) be altered to "four."

2. That in By-law 29 the second sentence be altered so as to read, "Any Associate shall be eligible to serve as an Associate-Member of Council."

3. That in By-law 30 the word "three" in the seventh line be altered to "six;" and further that the words "but the names of members of the existing Council shall be distinguished by an asterisk" be omitted from the same By-law.

The object of the proposed changes was (1) to increase the number of Associate-Members of Council, so that there shall be four instead of two; (2) to free a large body of Associates of a present disability to serve on the governing body, by removing the restriction confining Associate-Members of Council to those only who have been in independent practice not less than three years; and (3) to omit from the balloting paper any distinguishing mark against the names of members of the existing Council. As regards By-laws 25 and 29, the changes were proposed in response to representations made by a body of Associates that their class was insufficiently represented on the Council; and as regards the second alteration in By-law 30, to meet an objection that the asterisk against certain names on the balloting paper was prejudicial to the election of those not so distinguished. The Chairman reminded the Meeting that under the Charter Fellows only were entitled to vote in respect of alterations in the By-laws.

Recommendations 1 and 2 having been proposed and seconded were declared duly carried.

With regard to the first portion of the third recommendation, this was shown to be necessary by the increase of Associate-Members of Council dealt with in the first recommendation—it meant that at least six Associates must now be nominated instead of three, and that four of them would be elected.

Mr. William Woodward [*A.*] proposed that not less than "nine" Associates should be nominated by the Council for election.

Mr. Edwin T. Hall [*F.*] pointed out that it

would be open to members with the requisite number of backers to nominate nine or any greater number. The machinery for that already existed. The By-law as modified provided that the Council should nominate not less than six. It might happen on some occasion that they could not get nine nominees, in which case the voting-papers might be invalidated, and they would get no Associates elected at all.

Mr. W. D. Caröe [*F.*] said that Mr. Woodward's argument carried to its logical conclusion would mean that some forty Fellows ought to be nominated to serve as ordinary Members of Council, though only eighteen of them could be elected.

Mr. Woodward's amendment being put to the vote was lost, and Recommendation 3 being moved as a whole was thereupon carried.

Mr. Woodward said that, following on the latter portion of the resolution just passed, he had promised to second a proposition to be brought forward by Mr. H. H. Langston if he had been able to be present. His proposition was that the number of consecutive years each member had served on the Council should be added to his name on the balloting paper. As Mr. Langston was not present he begged to move that proposition.

The Chairman said that, as this involved an addition to the By-law, the Council should have had notice of the proposition. As the matter stood it could not be voted upon at that Meeting. There had been much said as to the length of time many members had served on the Council. As a matter of fact but few of the ordinary members had been on more than three or four years, which showed that fresh blood was not wanting on the Council.

Mr. Caröe said he had always strongly supported the introduction of young blood. He had been rather surprised to find that there were so few senior members of the Council who had served so long as five years, and he regretted to say he was one of them.

Mr. Hall said that practically the only man who would come under the disability of age, if he might use the phrase, would be Mr. Gruning. There was, however, no more energetic member in the Institute than Mr. Gruning, and his retirement would unquestionably be a serious loss both to the Institute and to the Council, because of his great experience in all matters appertaining to the practice of an architect. Mr. Gruning had been a member of the Council for something like twenty years, but he thought Mr. Woodward would be the very last man to vote against him. If, however, it once got abroad that, because a man had been a member of the Council for so many years he should be struck off, people who did not know Mr. Gruning might vote against him.

Mr. Woodward desired to say at once that if it was thought the suggestion he had made would lead to the state of things mentioned by Mr. Hall with regard to Mr. Gruning, he would immediately and most willingly withdraw his suggestion. If there was a man in his opinion most useful to the Institute from his varied and practical knowledge and remarkable vigour, it was Mr. Gruning. With the possibility of such a loss staring them in the face, he hoped the suggestion might be dropped altogether.

Mr. Hudson [*A.*] said he was glad to hear Mr. Woodward so express himself. He could not see the use of taking away the asterisk before the name and then giving these particulars. Members could seek out from former Kalendars how long candidates had served, and take steps among themselves if they thought fit to vote for younger men.

Mr. Owen Fleming [*A.*] said that he should like, on behalf of those with whom he had been working, to express their thanks to the Council for the way in which they had met the views of the deputation that waited on them some few months ago. If he might say so, this was perhaps almost an occasion for a new departure in the policy of the Institute. Looking back on the history of the past four or five years, it was evident that there had been dissatisfaction among some of the junior members, which ultimately found expression in a sort of guerilla warfare. That condition of affairs was eminently unsatisfactory to the Institute as a whole and to everyone concerned, and it led to the adoption of some form of elementary organisation to formulate definitely the views that were being irregularly expressed by individual Associates. That organisation had grown, and had been well supported by Associates—in London by personal effort, and in the provinces by subscription. The whole arrangement culminated in the deputation that approached the Council some six or eight months ago. They had not got all they asked for—perhaps they did not quite expect all they asked for—but they had received a good deal of what they desired to get. There was one thing they had not yet obtained, and that was the working together of Associates and Fellows as one body. This co-operation they must endeavour to build up for the welfare of the Institute as a whole. He hoped, too, that some further outlet would be found for the energies of the Associates in actual work for the Institute, much in the same way as in the Architectural Association, where they had Sub-Committees who were charged with the investigation of particular phases of work, and who discharged particular obligations. In conclusion he was sure he was expressing the feelings of all those who had joined in the difficult work that they had undertaken, in offering their profound thanks for the conciliatory way in which the Council had met them.

The Chairman said he was sure the Council would feel gratified at this expression of appreciation and thanks on behalf of the Associates. It was the wish of the Council, as well as everyone

else, that the Associates should work with them and do all that could be done for the good of the Institute.

The late William Butterfield.

The Chairman (Mr. W. M. Fawcett) of the General Meeting of the 5th inst. made regretful reference to the decease of Mr. William Butterfield, F.S.A., and thought that the occasion should not pass without some record on their Minutes. Mr. Butterfield was not a member of the Institute, but he was admired and esteemed by members, who had shown their admiration for his works by nominating him for the Royal Gold Medal, which was conferred upon him in 1884. Mr. Fawcett said he was requested to state that a memoir of Mr. Butterfield would appear in the JOURNAL, and concluded by moving that a note of regret for his loss should be entered on the Minutes, and a letter of condolence be sent to his nephew, his nearest surviving relative.

Mr. Basil Champneys' Paper.—It should have been stated that the view of the principal front of the John Rylands Library, Manchester, given on page 107, was from a copyright photograph by Messrs. S. B. Bolas & Co., of Oxford Street, by whose kind permission it was reproduced in these pages.

REVIEWS.

MODERN ITALIAN ART.

History of Modern Italian Art. By Ashton Rollins Willard. (*Longmans, Green, & Co., Paternoster Row.*)

This book is written, in spite of its title of a "History," rather from the critical than the historical point of view. Its real and even professed object is to show that modern Italian art deserves more consideration from the world than it at present receives, to recall attention to it, and to chronicle the achievements and the gifts of the principal modern Italian artists, many of whom are to the English art world at present only names, if they are even that.

In opening his subject Mr. Willard asks the reader to go back with him to the beginning of the present century, and to endeavour to realise what was the estimation of modern Italian art at the time when the name of Canova was one of world-wide fame.

> "Such as the great of yore, Canova is to-day,"

wrote Byron in *Childe Harold*; Byron, whose critical perception of art was shallow enough, but who gave expression in these matters to the general convictions of his own day. In less concise language Mr. Willard thus describes the situation:—

> "It is impossible to take up a memoir or biography of that period, touching the life of a person interested in art, without observing that the Italian art of the day was a matter of vital concern, more particularly the sculptural art. Canova's reputation was then at its height. Everyone who had the slightest contact with him magnified it in his conversation and in his correspondence. This was particularly true in England at the time of the readjustments following the final defeat of Napoleon in 1815. The gifted and amiable Italian, who for twenty years had been delighting the whole art world by his graceful creations, was then in London—called there to pronounce an expert opinion on the Elgin marbles. He was revered as the greatest plastic artist of his time. His voice was the Delphic oracle of sculpture. A single immersion in the current of art-opinion of that day would leave one in a wholly readjusted attitude towards modern Italian art; certainly towards its possibilities. It would give the reader a tendency to look upon the subject without prejudices, and a willingness to consider the Italian artist in a favourable light, which I should be most glad to create in his mind here at the beginning of this first chapter."

But would it have this effect? Many people who nearly ignore Canova at present would, no doubt, be very much surprised if they could realise for a moment what he seemed to be to the art-world of his own generation; but would this realisation alter our present view? It may be admitted that Canova is underestimated at present, and that if he was not a great sculptor he was a very remarkable one, not only for the gracefulness of his work, but for the immense amount of it which he produced. One conception of his, the "Cupid and Psyche," will perhaps always retain its hold upon us as one of the most graceful translations of the passion of love into sculptural form. But the critical standpoint is altered. We know very well now why Canova does not retain the place in art which he looked to have and which his contemporaries prophesied for him. It was because he was only an echo of the antique—a classic at second hand. We have the same phenomenon in the case of Gibson, once thought to be England's great sculptor, and who in the confidence in his own greatness left his collected works, or the casts of them, to the Royal Academy, on condition the Academy built a gallery for them; a condition which was very inadequately carried out. But who cares much to go into the Gibson gallery now? It represents a dead art. In his belief in Greek art instead of in nature as the fountain of inspiration, Gibson wasted his talents on unrealities, and the one really living work among his important productions is the "Hunter and Dog," a piece of nude *genre* which is natural and powerful, and owes little or nothing to Greek precedent.

The author seems to admit, indeed, that the main influence of Canova on the modern Italian school of sculpture was to bring about a reaction. No one, he says, can understand Bartolini, "the great modern leader," without understanding Canova; not, however, as we take him to mean, because Bartolini follows Canova, but for the opposite reason—that an important element

in Bartolini's work was to get away from what Canova had done. And this, if it be the case, may be taken to be one explanation of the extraordinary tendency towards unsculpturesque realism among modern Italian sculptors. They had found out the pseudo-classic mistake of Canova and his school, and rushed in the opposite direction into works in which what ought to have been *genre* paintings were translated into marble carving, with all the details of costume—"hat, and coat, and hymn-book too." From this most degraded form (intellectually considered) of realistic sculpture the Italian school seems now to have emerged again; the subjects treated are more sculpturesque, but the productions appear seldom to rise above a pleasing mediocrity; and this result seems to argue a want of *stamina* in the modern Italian mind. We have had in England the same reaction against pseudo-classicism in sculpture, but with what a different result! English sculpture, for artistic interest and vitality, is now second only to French, and it has the merit, moreover, of having avoided the fault of violent and exaggerated action which is unfortunately too much invading recent French work. The best of the modern Italian sculpture seems to have achieved little more than the negative merit of avoiding bad taste.

If there is more to be said for it than this, the author has not given us proofs of it. His only illustration from Bartolini's work, the Demidoff monument at Florence, is a *fade* affair, and appears to be quite in the school of Canova. Possibly this was done before Bartolini "came to his colours;" in the latter part of his life (he died in 1850) it appears that he had set up in so many words the standard of realism—"Everything in nature is beautiful in its way, and he who learns how to copy has learned the whole lesson of art;" an ideal as far wide of the mark in one way as Canova's was in another way. But in a book like this, the object of which is to recommend modern Italian art to English readers, copious illustration was a *sine quâ non*; so little of either painting or sculpture of the modern Italians gets to our exhibitions.

Concerning the few illustrations given, one may say that the bane of the best of them is a certain undefinable sentimentalism. This is the quality of Dupré's "Pietà," and of Monteverde's "Madonna and Child" at Genoa; the latter very pretty, but rising to no higher character. Ferrari's "Ovid" is a finely draped classicality, the stern aspect of which, however, is little in keeping with one's natural ideal of that exceedingly amorous poet. The symbolical "Revolution" by Ximenes, on the other hand, is melodramatic, a kind of petrified *scream*. Tenerani, who was one of the earlier successors of Canova, and one of those whose works are best known in England, probably attained a greater breadth and repose of style by coming under the influence of Thorwaldsen. His figure of the "Angel of the Resurrection" in Castle Ashby Church (one apparently of several repetitions of the subject) shows this influence in a marked manner, and almost suggests a weak Thorwaldsen statue—Thorwaldsen shorn of his Scandinavian vigour: but it has repose and dignity.

Modern Italian painting is even less known in England than sculpture, and illustrations in the book are even scarcer, so that it is hardly worth while to say more than that the information here given may be very useful to those who are likely to be in the way of visiting exhibitions or collections of modern Italian paintings, in letting them know something about the various artists and what to look out for. Among the few illustrations Laurenti's half-length of a girl, under the title "Candidum Lilium," is a very pleasing *genre* picture, remarkable for its simplicity and directness of treatment. One of the recent Italian painters, Boldini, who has become a resident in Paris and was a regular exhibitor at the "New Salon," is therefore more familiar to Englishmen. His portraits, which receive great praise from the author, are undoubtedly very clever in a kind of sensational way, but their style seems to me detestable both in regard to colour and character. Boldini had a portrait group of a well-known Paris artist and his wife and daughter in the New Salon some years ago, about which another member of the family expressed himself to me with absolute anger, saying it was in the worst possible taste and a mere caricature of the people represented.

A chapter is devoted to the modern architects of Italy. One of the most prominent among the earlier men of the century, Cagnola, is illustrated by his Arch of Peace at Milan, which, however, is a mere modern repetition of a Roman triumphal arch, carried out with good taste and a feeling for symmetry and proportion. Modern Italy has had her Classic revival and her Gothic revival, like England, and among those who belong to the latter (and later) school De Fabris has obtained a lasting fame as the architect for the façade of the cathedral of Florence, though the façade as built does not either represent Gothic revival or the real predilections of the architect, who wished to have a three-gabled façade, on the model (in a general way) of Orvieto and Siena, while those who wished for a façade on the more classic lines, and following the slope of the roof, carried the day with the help (oddly enough) of Viollet-le-Duc, whose opinion was asked for, and who gave it in favour of the single low-pitched gable, as carried out. I think he was right, and that the treatment adopted is more in keeping both with the style of the remainder of the church and with considerations of artistic truth than De Fabris' three gables standing up in the air would have been; but De Fabris, though bowing to cir-

cumstances, never altered his own opinion, and declared "he should die unrepentant of the three gables." Readers will find in these chapters also some information as to the late Signor Brentano, the successful young architect in the Milan façade competition, who so sadly died just as fame and fortune seemed within his grasp. Among others who are prominent are Signor Sacconi, the architect of the Victor Emmanuel monument at Rome, Signor Beltrami, of Milan, who obtained a second premium in the façade competition, and whose name is well known to English architects, and Signor Calderini, whose Palace of Justice at Rome is now in progress. The late Signor Basile, of Palermo, the architect of the great theatre at his native city, seems, however, to have had most claim of any of the modern Italians to the rank of a really great architect, though he retained his adherence to the pure classic style after the reaction against it had set in. But he was one of the few classic architects of Europe who treated this style of building with something of the grandeur and massiveness of its Roman originals; he was in Southern Europe somewhat of a counterpart to Poelaert in Northern Europe; and as the latter had his great opportunity in the Brussels Law Palace, so Basile had his opportunity in the Teatro Massimo at Palermo, which was built regardless of economical considerations, and is in its way a really impressive and remarkable structure.*

Mr. Willard's book is throughout admirably written and apparently based on full knowledge of his subject, and would be an excellent text-book for anyone who went to Italy with the express object of studying modern Italian art. Most of us who visit Italy for a short period do so to study the great works of the past, not the weaker ones of the present; and it is probably only to Englishmen who have become permanent residents in Italy that her modern art is or can be much known at first hand. Hence the desirability, already referred to, of copious illustrations, the want of which is the one defect of this book.

H. Heathcote Statham.

WIMBORNE AND CHRISTCHURCH.

Wimborne Minster and Christchurch Priory: a Short History of their Foundations and Description of their Buildings. By the Rev. Thomas Perkins, M.A., F.R.A.S., Rector of Turnworth, Dorset. With Illustrations from Photographs by the Author. 8o. *Lond.* 1899. *Price* 1s. 6d. [*George Bell & Sons, York Street, Covent Garden, W.C.*]

This book is one of a series of Cathedral histories which are being published by Messrs. G. Bell and Sons. It supplies a want which has long existed of a well-written handbook in a cheap and portable form to these interesting churches, which have become in late years so well known, owing to their close proximity to Bournemouth.

The history of Wimborne Minster has been well and ably put together, and the information brought up to the latest date. The illustrations are numerous, original, and being principally from photographs are clear and well defined. The author suggests that the name Wimborne is a contraction for Winterbourne, so many villages in the county of Dorset being so called; but, as he himself observes, these are all situated beside streams of water that flow only during the winter months; whereas the river Allen, which has its course through the town of Wimborne, flows on through the summer as well as the winter. The usually accepted origin of the word from the river Win or Alwyn, now called the Allen, is, however, the most probable, although for some reasons the definition of the first part of the word from *Twin*bourne is preferred by many, the town being situated at the junction of the rivers Stour and Allen.

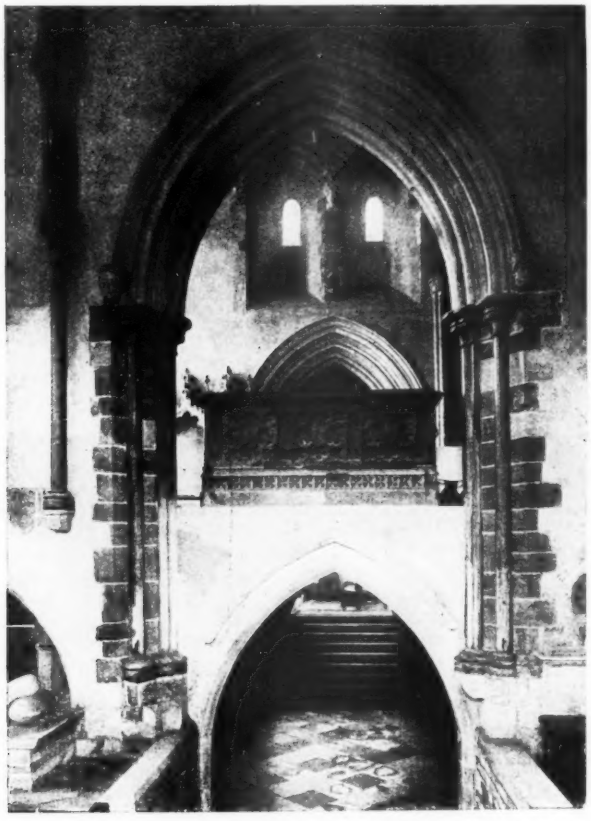
A slight error is made in describing the routine of the duties carried out by the three Priest Vicars under the Royal Peculiar. Instead of a month they each served for a week in turn, the one in residence taking all the fees, &c., payable during the week, one of the other priest vicars acting as his curate in the Minster, and the third undertaking the services at the chapel at Holt, a hamlet about three miles away.

A capital description is given of the history of the building from its earliest days, and the various changes and alterations that have taken place from time to time are alluded to. In describing the alterations in the chancel made in 1866 a mistake is made in saying "the remaining stalls were taken away." These, with the canopies, &c., were all ruthlessly swept away at the time of the restoration in 1855, with the exception of the four stalls on each side of the chancel. In 1866 they were increased to their present number to provide sufficient accommodation for the choir, and the level of the platforms again raised to the heights they occupied before the restoration in 1855.

As may be expected, the author is very severe in his criticisms of the necessary works of reconstruction that have taken place from time to time. In speaking of the last of these works, which were carried out under the late Mr. Pearson in 1891, he says, "These were taken in hand with the usual result, namely, the destruction of some existing features, such as the seventeenth-century tracery of the north window, and the raising of the walls, &c." An examination of the north elevation on page 21, from a photograph taken before these alterations, will clearly show what had taken place, viz. the whole of the cusping, &c., of the tracery of the original window had been cut out by some economical churchwarden, and the intermediate mullions lengthened to support the apex

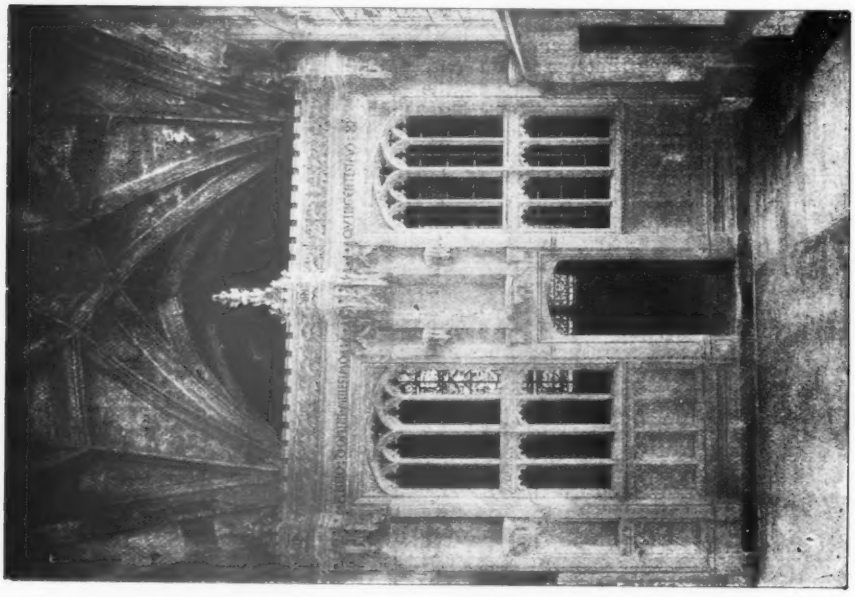
* Elevation, section, and plans of this theatre will be found in *The Builder* for January 4, 1896.

of the smaller arches of the side-lights, to permit the easier and cheaper glazing of the window; and the oval window in the centre was hung in a heavy iron frame, which at one time opened on centres. The window was most unsightly in its mutilated condition; as much as possible of the old stonework of the jambs and mullions have again been refixed, although the author rather leads his readers to suppose that the old window "was only removed to make room for a nineteenth-century window in decorated style, which, however, differs from any window in the Minster." He goes on to find fault with the restoration of the roofs to their original pitch, which necessitated raising the walls of the transepts. During the progress of the work ample proof was found that the walls had been lowered, and the water tabling on the exterior of the lantern tower showed the exact position the Norman roofs occupied. The sun dial, which was balanced on the apex of the south transept gable, was not refixed in that position, because of its great weight, which had been the probable cause of the giving way of the masonry of the gable and its hanging over so much to the south. From the marks found on the masonry it had evidently been removed from some other position before being fixed on its lofty home. It will be seen that the author takes great care to point out the mischief that was done during the recent reconstructions, but gives no credit to the architect for the bringing to light of the interesting features that were uncovered and again exposed to view during the progress of the works—viz. the altar recess in the north transept, with its mural painting of the Holy Rood, with three if not four paintings of the same subject one over the other, and the remnant of an alabaster shrine walled in to support the foot of the cross, or the remains of the beautiful shafted window discovered in the east wall of the south transept.

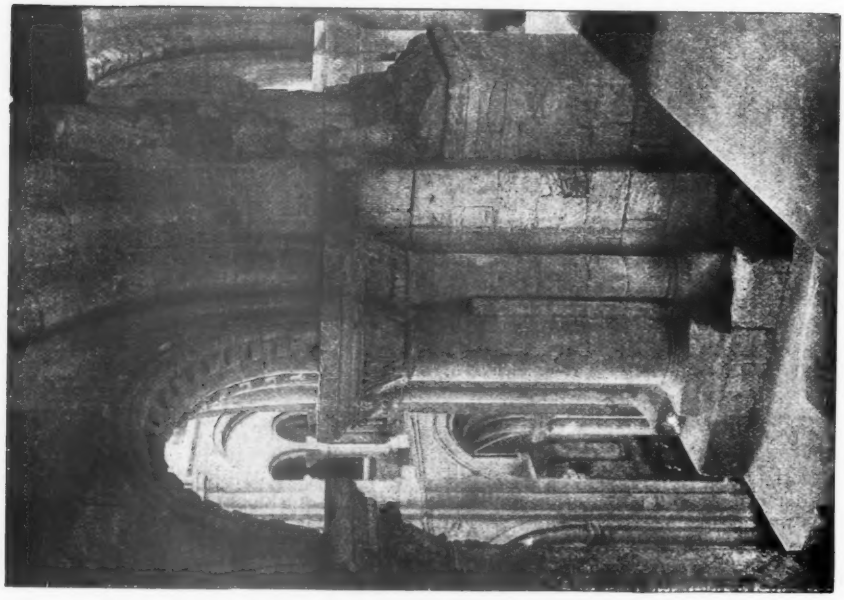


WIMBORNE MINSTER: ENTRANCE TO CRYPT.

We are all much indebted to the Rev. Thomas



CHRISTCHURCH PRIORY: THE DRAPER CHANTRY



CHRISTCHURCH PRIORY: FROM THE NORTH TRIFORIUM.

Perkins for his graphic and able description of the early history of Christchurch Priory, showing as it does an intimate knowledge of the subject which must have entailed a vast amount of resource and study.

In his description of the various renovations that have taken place he speaks, as one would expect, entirely from the antiquarian point of view; he finds fault with the restorer for attempting to imitate the tooling of the old stonework, and suggests that the old stones ought to have been left, "even if much decayed." He finds great fault with the restoration of the chapel at the east side of the south transept, "where this reprehensible practice is carried to its fullest extent."

We should probably all agree with him in condemning the removal of the plaster from the walls of St. Michael's Loft. He admits that a large and old building such as this needs constant repair to keep it sound; but how this can be done without replacing the decayed and weather-worn stones it is rather difficult to see.

The description of the building seems to have been taken to a large extent from Mr. Ferrey's work. It conveys a very good description of the church and will prove most useful to the student.

The views which accompany this notice are specimens of the excellent illustrations given in the book. W. J. FLETCHER.

SANITARY SCIENCE.

The Plumber and Sanitary Houses. By S. Stevens Hellyer. Sixth Edition. 8o. *Lond.* 1900. *Price* 12*s.* 6*d.* [*B. T. Batsford*, 94, *High Holborn.*]

In many respects the simple announcement of the issue of the sixth edition of an important technical work would seem sufficient testimony of its value; but, as Mr. Stevens Hellyer continues to add matter of great interest to each successive issue of his book, the sixth edition of *The Plumber and Sanitary Houses* demands more than passing notice.

Few architects would expect to find in this treatise a chapter upon the purification of sewage; such, however, exists, and herein is the principal feature of the latest edition. Mr. Hellyer is ever well abreast of the times, and while confessing that he is neither a chemist nor a bacteriologist clearly describes the best means of sewage purification now in use.

Among the new illustrations of sanitary appliances a view of an elaborate white-ware enclosure to the "Optimus" valve closet is given. This enclosure, almost cubical in shape, seems to bridge over the considerable gulf between the time-honoured enclosed wood seat with its hidden evils and the pedestal in all its solitary nakedness. In connection with these closets Mr. Hellyer says, "For fixing upon fire-proof floors I have patented a valve closet, 'Optimus H,' with a special lead trap arrangement for turning round to any point of outlet at the back and above the floor."

In the chapter dealing with slop sinks and their wastes new illustrations are given of very modern hospital sinks, with special arrangements by which bed pans may be flushed in an inverted position.

A new illustration of white glazed circular-backed urinals without basins draws attention to a design that has much to recommend it in appearance and apparent cleanliness; but the splashing difficulty, not yet overcome in this pattern, is pointed out by the author.

An interesting note under the section devoted to water supply describes the Chamberland-Pasteur filter and the Berkefeld filter. These are the only two out of many tried and reported upon in the *British Medical Journal* that arrest the passage of disease germs. The essential difference between these two patterns appears to be their relative speed in working. The former filters somewhat less than a quart per hour under a pressure of about 32 lbs.; the latter filters 20 gallons in the same time under a pressure of about 35 lbs. The illustrations show the method of fixing these filters on the drinking supply with, in one case, an arrangement made by Mr. Hellyer's firm for storing the filtered water to make the otherwise very slowly arriving product of the Chamberland-Pasteur filter available for immediate use.

Unquestionably the most important addition to the work under review is the chapter upon that difficult subject cesspools and their overflows; with this is incorporated notes on the purification of sewage previously referred to. The author truly says cesspools should be abolished, but for several reasons in many districts this is impossible for the present. So Mr. Hellyer describes and illustrates a system for a house in the country, comprising an inspection chamber, screening tank, and soakage cesspool, the latter introduction assuming that no water is drawn from wells within a given radius of the cesspool. Happily, we think, many urban district councils do not allow such soakage cesspools. Where they are permitted few are constructed that work so satisfactorily as the one described by the author. In closing this part of the subject Mr. Hellyer, however, states that "it is better to dispense with cesspools and treat the sewage by some good system, so as to secure a pure effluent, and there is now no difficulty in doing this." The author describes and illustrates the septic tank system of sewage purification by drawings of an installation carried out by his firm. The plan will be recognised in its essentials as the arrangement first brought to prominent notice, we believe, by Mr. Cameron, of Exeter, and now familiar to those who have studied this engrossing subject. Mr. Hellyer's statement that there is now no diffi-

culty in obtaining a pure effluent requires, perhaps, some qualification. For instance, the quality of the effluent obtained, whether it be by precipitation, chemical treatment, filtration, or by septic tank treatment and aerobic action, is scarcely ever constant, and the standard of purity insisted upon by local authorities who have the care of rivers and streams, and who are now very much alive to this question, is difficult to maintain. Nor does the difficulty end with the production of the pure effluent. The effluent must be regularly and efficiently dispersed. In cases where the flow is direct into a watercourse the sample bottle is continually in use, and in cases where the disposal is by irrigation sufficiency of area and suitability of soil are exacting essentials. And over all must be a watchful eye with intelligent management. Whether or no all this can be had and be maintained in other than public installations the next few years will probably show. Meanwhile Mr. Hellyer indicates that he is concerned with the importance of producing appliances that will help to the solution of one of the most pressing difficulties of modern times. The chapter on sewage treatment alone will make the sixth edition of *The Plumber and Sanitary Houses* notable. As to the work as a whole, the excellence of the type, the profuse illustrations, the careful lettering of the "cuts," the accurate references thereto in the text, the racy and sometimes grimly humorous style Mr. Hellyer adopts, all make the matter very readable.

The simple yet scientific principles of good workmanship and the highest sanitation enunciated by the author are written for the million, including all plumbers, but favoured is the one in a thousand who either by accident or expenditure is able to live in an environment of these principles materialised. SYDNEY B. BEALE.

NOTES, QUERIES, AND REPLIES.

Ancient Monuments Protection Bill.

From JOHN HEBB [*F.*]—

A bill has been prepared and brought in in the House of Commons by Lord Balcarres, M.P. for the Chorley division of North Lancashire, to amend the Ancient Monuments Protection Acts. The bill proposes to extend the provisions of Section 1 of the Ancient Monuments Protection (Ireland) Act 1892 to Great Britain. Power is proposed to be given to County Councils to purchase or preserve monuments, and to receive voluntary contributions for the maintenance of such monuments, which, when placed in charge of a County Council or the Commissioners of Works, are to be exempt from rates and taxes, and shall not be chargeable with estate duty or any other duty leviable on or with reference to death.

Ancient Gold and Ivory Work and the Ionic Capital.

From Mr. CLEMENT HEATON, Neuchâtel—

I am glad to see that Dr. Murray, in his Paper on "Excavations in Cyprus, 1896" (p. 21, *ante*), favours the idea that the gold reliefs from Cyprus were made by beating over wires. In order to clinch the matter I append a photograph (fig. 1) of a piece of silver beaten over a wire, giving

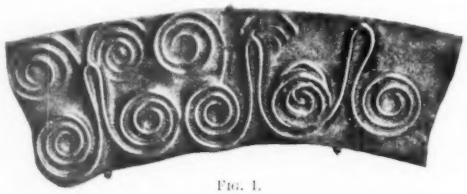


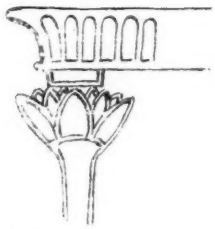
FIG. 1.

precisely the effect of the illustration fig. 3, No. 4 (p. 28, *ante*). The upper parts, it will be seen, are slightly effaced, while the lower ones are in high relief over them—in both Dr. Murray's plate and in my photo. Again, in one corner a doubling of the line is perceptible, precisely like that shown in No. 1, fig. 3 (p. 28), due to the silver leaf moving slightly.

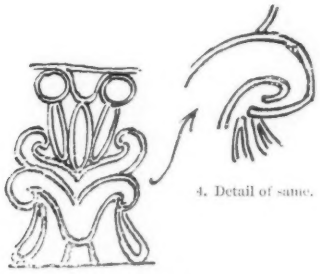
My attention was directed to this kind of work while looking up evidence for a lecture in March 1891 at the Society of Arts. I remember seeing samples of peasant jewelry from Sweden done in this way also. The specimens Nos. 10 to 12 (p. 29) were, I believe, beaten over carved work, but face uppermost, *i.e.* beaten *over* moulds, not *into* them. The Louvre Museum contains a number of examples of gold work made with bent wires, and also examples of *repoussé* gold work made by beating thin plates over such wires. It seems evident this was one of the most prominent ideas of ancient work in precious metals, and it is here I would look for the origin of many Greek forms of ornament common in decoration.

It suggested itself to me that the relief work in stone, in spiral lines and concave relief, was copied from the gold work, as one can see its origin quite clearly in the metal work, and cannot imagine why stone should be so *carved*. If so, does not early architecture owe something to goldsmiths' work in the way of decoration?

I note Mr. Myres suggested (p. 31) that the Ionic capital has its origin in metal work. Has the idea ever been worked out as to its being a copy of some kind of *cloisonné* inlay? Early times in the East were much under the influence of the *cloisonné* form of art, and I send a few sketches (figs. 2–11) from various sources which seem to show how the capital came into existence. It would be interesting to know if this can be finally substantiated, or whether it is an illusion.



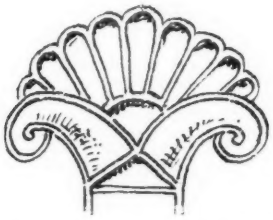
2. Capital in cloisonne Pectoral of Onsertesen II. Dahshour.



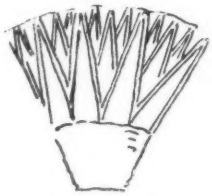
3. Flower ornament in gold cloisonné Bracelet in the Louvre Museum.

4. Detail of same.

5. Capital, Tablet of Sippara.



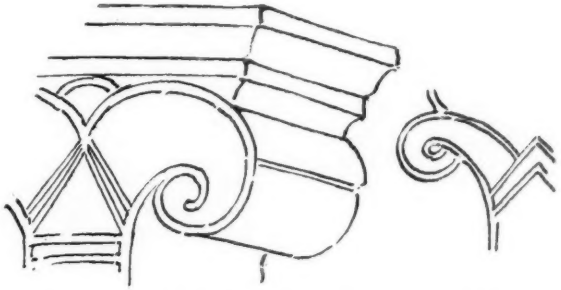
6. Ivory carving forming kind of cloisonne. N.W. Palace of Nimroud.



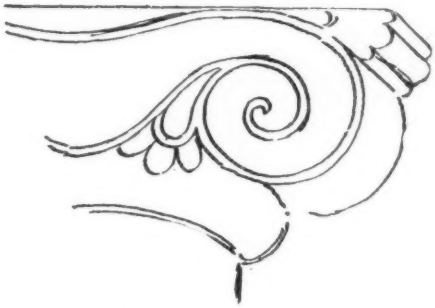
7. Bronze capital, about 6 inches high, from Tel-el-Yahoudeh. Now at British Museum. Blue cement colour still remains in parts between the cloisons.

8. Part of a carved ivory formerly inlaid with colour. Nimroud.

9. Part of same ivory.



10. Two capitals given by Perrot and Chipiez (vol. iii. p. 116), showing the same endings of spiral lines as in the ivories, and the same triangular and horizontal openings. Note that the carved pavements from N. Palace at Kouyunyik still retain coloured cements in places, showing that stonework was inlaid with colour.



11. Very early Greek capital. Perrot and Chipiez, p. 264.

MINUTES. IX.

At a Special General Meeting, held Monday, 5th March 1900, at 8 p.m., Mr. W. M. Fawcett, M.A., *Vice-President*, in the Chair, with 13 Fellows (including 9 members of the Council) and 18 Associates (including 1 member of the Council), the Chairman having announced that the Meeting was convened for the election of the Royal Gold Medallist for the current year, moved, and it was thereupon unanimously

RESOLVED, That, subject to Her Majesty's gracious sanction, the Royal Gold Medal for the promotion of Architecture be presented this year to Professor the Commendatore Rodolfo Lanciani, *Correspondant de l'Institut de France*, D.C.L. Oxon., Hon. Corresponding Member (Rome).

The Meeting then terminated.

At the Ninth General Meeting (Business) of the Session 1899–1900, held at the conclusion of the Meeting above minuted, Mr. W. M. Fawcett, M.A., *Vice-President*, in the Chair, with members present as above, the Minutes of the Meeting held 19th February [p. 180] were taken as read and signed as correct.

The decease was announced of the following members:—Alexander Kendall Mackinnon, recently placed on the list of *Retired Fellows*, and Eley Emlyn White, *Associate*.

Reference having been made to the death of Mr. William Butterfield, *Royal Gold Medallist* 1884, on the motion of the Chairman it was

RESOLVED, That the Institute do record its regret at the death of Mr. William Butterfield, and that a letter of condolence be sent to his nephew, his nearest surviving relative.

The following Associate attending for the first time since his election was formally admitted and signed the Register: viz. Henry Tanner, jun.

The Hon. Secretary drew attention to a list of donations to the Library which would be issued with the next JOURNAL, and a vote of thanks to the donors was ordered to be entered on the Minutes.

The following candidates for membership in the various classes were elected by show of hands, under By-law 9:—

AS FELLOWS (3).

DAVID BARCLAY NIVEN [*A.* 1890].
WILLIAM EDWARD RILEY [*A.* 1883].
HERBERT HARDY WIGGLESWORTH [*A.* 1891].

AS ASSOCIATES (22).

FRANCIS HENRY ALLEN [*Probationer* 1895, *Student* 1897, *Qualified* 1899] (Kettering).
WILLIAM HENRY ANSELL [*Probationer* 1894, *Student* 1896, *Qualified* 1899].
SPENCER ELLWOOD BARROW [*Probationer* 1891, *Student* 1894, *Qualified* 1899] (Lancaster).
FRANCIS WILLIAM ASHTON-BUCKELL [*Probationer* 1892, *Student* 1898, *Qualified* 1899] (Arundel).
THOMAS JOSEPH BYRNE [*Probationer* 1897, *Student* 1898, *Qualified* 1899].
BESSIE ADA CHARLES [*Probationer* 1893, *Student* 1896, *Qualified* 1899].
DAVID McLEOD CRAIK [*Probationer* 1893, *Student* 1896, *Qualified* 1899].
ALFRED HERBERT FOSTER [*Probationer* 1896, *Student* 1897, *Qualified* 1899] (Brisbane).
FRANK FOSTER [*Qualified* 1899, *Special Examination*].
STANLEY HINGE HAMP [*Probationer* 1896, *Student* 1897, *Qualified* 1899].
JOHN HARRY WOODALL HICKTON [*Qualified* 1899] (Walsall).
MATHEW HONAN [*Probationer* 1896, *Student* 1897, *Qualified* 1899] (Liverpool).
HERBERT EDWARD ILLINGWORTH [*Probationer* 1893, *Student* 1895, *Qualified* 1899] (Leeds).
ALFRED RALPH KEIGHLEY [*Probationer* 1892, *Student* 1895, *Qualified* 1899] (Liverpool).
THOMAS ANDERSON MOODIE [*Probationer* 1890, *Student* 1895, *Qualified* 1899].
JAMES EDWARD COLEMAN SHIELD [*Probationer* 1892, *Student* 1895, *Qualified* 1899].
JOHN EDWARD SPAIN [*Probationer* 1895, *Student* 1898, *Qualified* 1899] (Wragby, Lincs.).
REGINALD HENRY SPALDING [*Probationer* 1894, *Student* 1897, *Qualified* 1899].
FREDERICK TAYLOR [*Qualified* 1899, *Special Examination*] (Aylesbury, Bucks).
RAMSAY TRAQUAIR [*Probationer* 1894, *Student* 1896, *Qualified* 1899].
THOMAS TYRWHITT [*Probationer* 1894, *Student* 1896, *Institute Medallist Drawings* 1898, *Qualified* 1899].
HAROLD WATTS [*Probationer* 1893, *Student* 1896, *Qualified* 1899] (Plymouth).

AS HONORARY FELLOW.

The Right Hon. Sir RICHARD TEMPLE, Bart., G.C.S.I., C.I.E., D.C.L., LL.D., F.R.S.

The Chairman announced that Mr. Edward Augustus Ould, President of the Liverpool Architectural Society, had been elected a Fellow at a Meeting of the Council held that afternoon.

The Business Meeting then terminated.

At a further Special General Meeting held the same evening, following the Meetings above mentioned, Mr. W. M. Fawcett, M.A., *Vice-President*, in the Chair, and members present as at the preceding Meetings, the Chairman announced that the Meeting was called to sanction changes recommended by the Council to be made in By-laws 25, 29, 30.

The object of the changes having been explained, the adoption of the first recommendation was moved by the Chairman and seconded by Mr. John Slater, B.A. [*F.*], and it was

RESOLVED, That in By-law 25 the words "thirty-six" in the first line be altered to "thirty-eight," and that the word "two" in the second line of section (*a*) be altered to "four."

The adoption of the second recommendation having been moved by the Chairman and seconded by Mr. Hugh Stannus [*F.*], it was

RESOLVED, That in By-law 29 the second sentence be altered so as to read, "Any Associate shall be eligible to serve as an Associate-Member of Council."

The adoption of the third recommendation having been moved by the Chairman and seconded by Mr. Edwin T. Hall [*F.*], Mr. William Woodward [*A.*] moved as an amendment the substitution of the word "nine" for "six" in the first portion of the recommendation. The amendment having been voted on was lost, whereupon the original motion was put, and it was

RESOLVED, That in By-law 30 the word "three" in the seventh line be altered to "six"; and further that the words "but the names of members of the existing Council shall be distinguished by an asterisk" re omitted from the same By-law.

A proposal by Mr. Woodward that the number of years members had served on the Council should be placed against their names on the balloting papers was withdrawn.

Mr. Owen Fleming [*A.*], on behalf of the Associates, having thanked the Council for the concessions accorded Associates by the resolutions above recorded, the proceedings closed, and the Meeting separated at 9 p.m.